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ELECTRIC RAILWAY TRACTION

A Supplement illustrating and describing developments in Electric Railway Traction is presented with each copy of this week's issue.

Guglielmo Marconi

IT is difficult to imagine the fourth decade of the twentieth century minus the many far-reaching direct, and indirect, results of the life work of Marconi, whose death in Rome at the age of 63 we record with regret this week. Although Italian both in name and birth—he was born at Bologna on April 25, 1874—Marconi owed much to the British Empire both in his parentage and in the sponsoring of his great life work. His father, Giuseppe Marconi, was an Italian country gentleman with little sympathy for scientific development, and Marconi's earliest support came from his Irish mother, formerly Miss Annie Jamieson of Wexford. Marconi, of course, did not "invent" wireless, for the pioneer work was undoubtedly the result of the researches of Heinrich Hertz, but he is worthy of the popular acclamation that has been accorded him for his work in perfecting and adapting for practical commercial use knowledge which previously had not extended beyond the laboratory walls. Marconi came to England in 1896 and was successful in enlisting the interest of Sir William Preece, the Engineer of the Post Office. Successful tests between St. Martin's-le-Grand and the Thames Embankment were followed by demonstrations across gradually increasing distances, and when the apparatus installed on the Royal yacht *Osborne* enabled Queen Victoria to communicate with the then Prince of Wales official recognition was complete. On December 11, 1901, radio signals were successfully transmitted from Poldhu in Cornwall to St. John's, Newfoundland, some 1,800 miles away, and progress thereafter has proceeded steadily and with ever increasing *tempo*. Marconi achieved both commercial success and world-wide honour, and his name will long survive as one of the great pioneers in the improvement of world communication.

* * * *

The Importance of Punctuality

When extra-high-speed trains are placed in service, such as the new Coronation trains of the L.M.S.R. and L.N.E.R., the importance of strict punctuality on the part of other trains is emphasised by examples to which several correspondents have lately drawn our attention. One correspondent found the stirring sight of the Coronation Scot dashing through Tebay insufficient compensation for a serious delay to the Keswick portion of the Lakes Express, which had been shunted to let the flyer pass, and from which he viewed the scene. The reason, of course, was that his own humbler train was behind time and could not be permitted to delay that which is now the cynosure of all eyes. Another correspondent was the victim of similarly mixed feelings when travelling a few days ago on the 11.45 Newcastle to Scarborough train, which was shunted at Thirsk for the southbound non-stop Flying Scotsman, and reached York 25 min. late. This correspondent tells us that the particular delay he suffered was passed on to quite a number of other services, including the 11.10 Scarborough Flyer from London. These cases, exceptional though they may be, are apt to provide a potent argument for the opponents of high-speed trains in general, and emphasise again the extreme importance of universal punctuality, for every unpunctual train occupies more than its share of the running lines.

* * * *

The Week's Traffics

Passenger train traffics of the four group companies make the largest contribution (£99,000) to the increase of £150,000 shown for the past week. Merchandise comes next with a net increase of £29,000, and coal records a net advance of £22,000. The combined increase of the previous week was £121,000. For the year to date the united earnings are £85,180,000, an increase of £3,816,000, or 4·69 per cent. Passenger train receipts contribute £36,466,000, an increase of £1,586,000, or 4·55 per cent.; merchandise earnings amount to £30,424,000, a net increase of £973,000, or 3·30 per cent.; and coal traffics to £18,290,000, a net increase of £1,257,000, or 7·38 per cent.

	28th Week				Year to date	
	Pass., &c.	Goods, &c.	Coal, &c.	Total	Inc. or Dec.	
	£	£	£	£	£	%
L.M.S.R. ..	+ 45,000	+ 17,000	− 3,000	+59,000	+1,437,000	+ 4·34
L.N.E.R. ..	+ 27,000	+ 7,000	+ 16,000	+ 50,000	+1,272,000	+ 5·30
G.W.R. ..	+ 4,000	+ 6,000	+ 13,000	+ 23,000	+ 716,000	+ 5·29
S.R.	+ 23,000	− 1,000	− 4,000	+ 18,000	+ 391,000	+ 3·65

Great Northern (Ireland) receipts for the past week show a net increase of £1,000, reducing the aggregate decrease to £13,550. On the Great Southern there is an increase for the past week of £240, which reduces the decrease for the year to date to £23,260.

* * * *

Three Months' Goods Train Traffics

Freight train traffics for all standard gauge railways in Great Britain for the twelve weeks ended March 20, 1937, showed on the whole a rise of 2·14 per cent. in units and of 2·38 per cent. in receipts compared with the

corresponding period of 1936 as indicated in the analysis published with the Ministry of Transport statistics for the month of March, 1937. In the higher class merchandise tonnage of 11,790,209 there was a rise of 618,471 tons or 5·54 per cent. and the receipts of £9,704,102 advanced by £387,115 or 4·15 per cent. Of minerals and merchandise (classes 1-6) 12,581,705 tons were carried, an increase of 385,436 tons or 3·16 per cent., with receipts of £3,240,110 which were higher by £51,894, or 1·63 per cent., than those for the corresponding period of 1936. Coal, coke, and patent fuel tons numbered 45,189,643, an increase of 482,806 tons or 1·08 per cent., producing receipts of £8,669,478, which were higher by £72,679 or 0·85 per cent. Livestock receipts amounted to £267,066, a decrease of £3,716, or 1·37 per cent. Improvement in higher class merchandise and tonnage was shown in each of the three four-weekly periods, but in the March period there was a fall of 2·97 per cent. in tonnage and of 4·03 per cent. in receipts in respect of traffic in classes 1-6. In January coal class traffics were down 7·36 per cent. in tonnage and 8·77 per cent. in receipts, but a recovery began to be shown in February.

* * * *

The Centenary of Euston Station

Euston, the official headquarters and principal metropolitan terminus of the L.M.S.R., has a special claim on our attention on the occasion of its centenary, for, despite piecemeal enlargements at various periods which have resulted in considerable deficiencies in layout at the present time, the station still bears the clear evidence of the intentions of its founders to build worthily the first main-line railway terminus in the world. In the early days of promotion the site of the London terminus was one of the many points about which differences of opinion existed. Originally, there were two rival groups promoting railways between London and Birmingham, but these agreed in 1830 to merge their projects into a united company. George Stephenson is reputed to have favoured a terminal near the Strand, while another survey fixed the site near the Marble Arch. In the Bill deposited before Parliament in the 1832 Session a terminus at Euston Square was adopted, but the opposition of powerful landed interests resulted in the rejection of this Bill by the Lords. When the line was authorised, in 1833, Camden Town was the terminus sanctioned, but subsequent powers enabled an extension to Euston to be made before any part of the line was opened, and this was actually included in the section upon which traffic began exactly 100 years ago. Some notes on the early days of Euston appear on page 147, and various illustrations on pages 156-7.

* * * *

The Victorian Scene

After the death of King George V floodgates were released and literature of all kinds has poured forth describing, criticising, praising, and condemning the Victorian era. Most of that which we have seen is surprising, inasmuch as it deals most inadequately with the vital influence of the railway, for few, if any, of the outstanding changes of Queen Victoria's reign were not the direct result of the changes in civilised life consequent upon the vastly improved means of transit which the railway provided. A notable exception to this lack of perception is afforded by a short article entitled " The Victorian Scene " which Mr. G. M. Young contributed to the columns of our contemporary *Country Life* a fortnight ago. In this he gives pride of place to a picture in the exhibition of Victorian painting at the Leicester Galleries which is entitled " Travelling in 1860." Its painter, Thomas Musgrave Joy, is little known to fame, and, as Mr. Young observes, the execution of the work is in many ways incompetent. The picture does, however, give us a characteristic portrayal of the social atmosphere of travel three-quarters of a century ago, and we agree with Mr. Young that " one of the delights of early railway travel was (and is, my friends, it is) the novel views of the English scene disclosed to eyes which had only seen England from the great high roads." We reproduce this picture on page 158, together with some of Mr. Young's racy comments on the occupants of the carriage.

* * * *

The East Indian Railway Derailment

We deeply regret to learn of the serious derailment and consequent heavy loss of life on the East Indian Railway last Saturday, as recorded in our news columns this week. It now seems certain that the death-roll exceeds 100, a figure that if it applied to an accident in the West would rank among the three or four highest. Unfortunately, however, in the East the 100 mark has been exceeded on several occasions. We ourselves have personal first-hand experience in Burma of a head-on collision resulting in about 130 deaths—most of them due to that terrible cause, scalding by escaping steam—and even this figure has been exceeded on more than one unhappy occasion. The reason for the numbers of casualties generally being higher in the East is that trains usually carry more passengers, each third class coach accommodating perhaps 50 per cent. more, on an average, than in the West. We mention this matter of death-roll, as, in the British press, stress appears to have been laid on it in this instance. And here we would utter a word of warning against the deplorable manner in which some of its organs published grossly exaggerated figures, due, no doubt, to ignorance of the fact that any railway accident in India is acclaimed as an act of the " Satanic Government," and exaggerated accordingly by the vernacular press.

* * * *

Remarkable Chinese Precepts

Addressing the Railway Training Class on the occasion of the graduation of its students—comprising selected stationmasters and trainmasters—at the Loyang Academy, General Chiang Kai-Shek, virtual dictator of China, made the following cogent remarks about punctuality. " . . . the framing of timetables for the running of trains should be as meticulous as, or even more so, than the framing of our laws. In truth, you should observe punctuality as much as the judges observe the laws of the land, otherwise not only the railway service will suffer, but the prestige of our country will be damaged, which . . . would be tantamount to endangering the well-being of the State. It should be noted that in modern times the actual strength of a country does not depend on military strategy and armaments alone, but also on transport facilities, which are more important. Ordinary train operations, therefore, are akin to military operations, in which a difference of one minute or even one second, may spell disaster." General Chiang also emphasised the need for strict supervision of menial staff, " whose work must be prompt and accurate and no negligence, trickery, or deception must be allowed. They must be sincere, courteous, polite and dutiful to all passengers, especially to the old and the weak, women and children, and the poor countrymen. These they must be ever ready to care for and help." These are great utterances by the head of a vast country so recently notorious for its despotism, corruption, and slowness, and for being behind the times, a land where roads were said to be " good for ten years and bad for ten thousand." Many other countries sup-

posed to be much more up to date might with advantage absorb and act up to these precepts.

* * * *

Air-Conditioning Outside America

Air-conditioning progress, while not confined to the United States, continues to be disappointingly slow elsewhere. The circumstance favourable to its rapid adoption would seem to be the combination of a discriminating and even ultra-sensitive travelling public and a land suffering extremes of climate. This combination is found in the United States where everyone has been made painfully self-conscious by lurid and very frank magazine advertisements dealing with perspiration, body odour, and other hygienic offences, but we do not know of any close parallel. Many people may be particular to American standards in some other parts of the world, but here the climate will be found to be generally equable. In the torrid zones the populace, apart from imported whites, is notoriously indifferent to hygiene, so much so that permission to take pigs and poultry into carriages adapted for human transport would secure an approval far more wide-spread than air-conditioning or any other luxury. In this issue we publish an article in which the principles involved in air-conditioning are set forth once again for the guidance of those who may hope to further its use on railways in the near future.

* * * *

Raised Frogs

It is not often that the street tramway can give hints to the main-line railway, but a feature of the remodelling of the important tramway junction in the City Square at Leeds is perhaps worth more serious consideration by railways than it has received in the past. The tramway junction at Leeds is a complicated one, and carries heavy traffic, and as it is in the centre of the city and just outside the new Queen's Hotel of the L.M.S.R. it was important to take precautions to ensure that the noise caused by the wheels passing over the intersections should be reduced to a minimum. This has been achieved by adopting the principle of raising the grooves so that the wheels run on their flanges through the junctions. In this particular work the grooves are only $\frac{3}{8}$ in. deep, and thanks to the use of Hadfield's Era manganese steel, which is extremely hard wearing, this junction should provide silent running for a very long time. The principle has been tried in railway practice, but so far as we know not on a very extensive scale. Nevertheless, the use of raised frogs in railway crossings to lift the wheel treads just clear of the surface at the points of intersection has been beneficial from the point of view not merely of reducing shock, and therefore wear and tear, but also of reducing noise.

* * * *

The Bouré Key Interlocking System

The death occurred on March 3 of M. Charles Bouré, who retired in 1920 after 36 years in the service of the P.L.M. Railway. It was he who, in 1895, when technical inspector at Paris, introduced the key interlocking system named after him and widely adopted in France. Within a few years a large number of stations in that country was equipped, for the system was well received by other lines as well as the P.L.M., there being over 250 installations on the Nord alone by 1899. Bouré's system enabled the benefits of interlocking to be obtained at moderate cost, and was found very satisfactory where the number of daily movements was not great, or points needed working only on certain special occasions. The most interesting application of the principle was probably that at the Chantilly station, $25\frac{1}{2}$ miles from Paris, built in 1897 to accommodate the increasing traffic, which had grown enormously since the establishment of the racecourse in 1856. The Nord had introduced both-way working on the up and down lines on race days between Paris and Chantilly in 1890, one of the earliest instances of the practice. The central key apparatus contained 39 keys and controlled the points and signals for 10 platform lines. The working was so well organised, with messengers to convey the keys, that as many as 22 trains could be received or despatched in an hour, while the cost of the equipment was kept very low. A large amount of Bouré interlocking still exists in France, where the name is as well known as that of Annett in this country, if not better.

* * * *

Locomotive Boiler Measurements

In practically all respects the dimensions of a locomotive are precisely as stated and therefore do not provide any ground for controversy. True the diameter of the tyres may be regarded as a variable quantity in the sense that as wear takes place there is a progressive reduction in size, whilst as a matter of course the weight of the engine and tender decreases as coal and water supplies are used. In all other respects, it might be thought, the proportions of the locomotive are fixed and permanent. Yet we have heard it argued by competent locomotive engineers that the length of the boiler barrel is rightly determined by the distance between the tube-plates as being the only really *effective* portion of the barrel; beyond that point the boiler becomes, at the rear end, part of the firebox, and, at the opposite end, part of the smokebox. Others contend that the boiler barrel proper must be measured over the combined length of the barrel sections, forming a complete unit, and they stress the point that this applies particularly to boilers in which a combustion chamber, forming part of the firebox, protrudes into the boiler barrel and has the effect of materially shortening the distance which separates one tubeplate from the other. It is a nice point perhaps, and one on which many of our readers will doubtless hold decided opinions; our own view is that the distance between the tubeplates, whilst representing one of the most important proportional features of a locomotive boiler, does not accurately represent the length of the barrel as a unit.

* * * *

Monmouthshire Malfeasance

A reader has pointed out to us that in our issue of June 18, we committed an error—in what we reserve the right to call etiquette—inasmuch as in two words we both raised and lowered the status of Newport among the great places of the earth. In short, we called it a *Welsh city*. Newport, it is pointed out to us, has not yet attained to civic status and very far from smarting under the stigma of being in Cymric hands proudly boasts that it is a municipal, county, and parliamentary borough in the county of Monmouth, England. Much as we dislike digging up disreputable pasts we must remind our critic that Monmouthshire (and of course Newport) was once Welsh and is so now in almost everything but name, having always come under the Welsh sphere of influence. When Offa's Dyke was built (in order we have been told to keep out a wave of Eisteddfods and other strange practices much indulged in by the Welsh) it was the fate of Monmouthshire to be placed on that side of the boundary where these influences could spread, with a result that today this county topographically, historically, idiomatically, and even geographically, is undeniably Welsh. As a final ruling we point out that in the serious and momentous world of football there is no hesitation in castigating Monmouthshire players by classifying them as Welsh.

The Wedgwood Report on Indian State Railways

THE first points that strike one about the report of the Wedgwood Committee on Indian State-owned railways* are the great area of ground covered by it and the number of recommendations concerning comparative details and side issues that it contains. Considering the route-mileage and capital involved, however (35,600 miles and £592,000,000), the width of its scope is perhaps hardly surprising. Indian railways have come through the past six or seven years better financially than those in England, America and other countries, but the committee considers that railway surplus should not be counted upon as a source of revenue to the Government of India either for providing funds as contributions to help the Provinces work their new autonomous constitutions, or for the relief of general taxation. Railwaymen will welcome the recommendation that railway finances should be established on an independent basis, without the ever-present threat that they be subordinated to political considerations. It remains to be seen whether, with the success of the reforms involved, the Government of India will agree to waive its right to squeeze, by hook or by crook, the last anna out of the railways.

The committee appreciates the efforts already made by Indian railway administrations towards retrenchment and economy generally, and points out that in the matter of average charges per passenger-km. and per ton-km., Indian lines compare favourably with those of other countries. Naturally there is room for considerable further economy in many directions, and in this connection the detailed suggestions embodied in the report are valuable. There is certainly room for permanent way maintenance economy by a wider use of motor trolleys on the lines of the South American B.A.G.S. and B.A.W.R. organisation, described in our issue of October 4, November 1, and December 6, 1935. On the other hand, with the recommendation that further attention be given to welding for bridge repairs, the fact that this practice is already firmly established, at any rate on some of the State Railways, might have been mentioned. For instance, the Bridge Department of the North Western Railway has, in addition to five welding sets in Jhelum bridge shops, no fewer than 13 portable sets distributed over the system for renewal and repair work. The reconditioning of fish plates, now a very widely established practice elsewhere, though it has been considered, has not been adopted to any great extent, as the report recommends. In spite of improvements already effected in the use of locomotives and rolling stock in accordance with the Pope Committee policy, an even higher standard is urged, as is also a further reduction in the percentage of units under repair. The question of hot boxes is one that must vary considerably on different railways even in India, and due allowance must be made for the heavy percentage of sand suspended in the atmosphere for long periods throughout the year in such areas as Sind. In this connection the initial expense of roller bearings in relation to ultimate economy seems to deserve consideration. The mention of improved buffing gear is of interest, but although complete trains with central automatic couplers have been in service experimentally (on the N.W.R.) the vast capital outlay necessary is as usual the stumbling block in the way of general adoption of any such valuable equipment, even if it should prove financially justifiable on grounds of reduced maintenance costs, shunting delays and accidents.

The committee's criticisms of passenger train speeds are very opportune. India is an ideal country for long fast runs, as gradients and curves are, as a rule, negligible. Daily bookings of 60 m.p.h. were in force and were regularly kept on the Eastern Bengal Railway as long ago as 1909, but were soon reduced, as the 85-lb. track would not stand up to them. But Indian main lines are now better equipped with ballast than those of many other countries, and, with modern locomotives and permanent way, there is no apparent reason why start-to-stop speeds should not be raised from 50 to 60 m.p.h. as a general mail and express standard on the broad gauge main lines. Seeing that all goods stock of this gauge is vacuum fitted, faster goods speeds are also feasible and would result in quicker turn-round of stock—which the committee strongly advocates—and better ability to combat road transport competition. The faster bookings of short-distance passenger trains and the elimination of the mixed train, except where traffic is very light, seem to us essential measures for meeting bus and car competition. The obvious success and the appreciation by the committee of the Economy Research Organisation must be as gratifying to Mr. Pope and his committee as it is well deserved, and the recommended extensions of its scope should prove remunerative. A word of warning is necessary in respect of the recommendation in the report that a review of the upper class passenger accommodation and the abolition of first class on certain lines are advisable. Whilst agreeing that in the cases of many branch lines where traffic is light, compartments of only one upper class are necessary, we urge very careful discrimination in the selection of these cases. The Indian objects to compartments being reserved for Europeans, yet there are reasons why representatives of the two communities should not be compelled to travel for any but short distances in the same compartment, and it is the retention of the first class that largely obviates this difficulty. The suggested substitution of two-berth coupés for four-berth upper class compartments is certainly sound, at any rate where traffic is light.

The committee is satisfied that the salaries of gazetted officers are not too high, and also considers that, in some instances, the reduction of administrative posts has already been carried too far; the Indian layman is constantly demanding the reduction of both. We welcome the assurance of Sir Ralph Wedgwood and his colleagues that retrenchment already effected has not been made at the expense of the lower ranks. The permanent strengthening of the Railway Board on the Traffic side is an undoubtedly sound recommendation, as is the suggestion that audit and accounts officers on State lines should be railway staff and be held responsible to Agents, whom, by the way, the committee would like to be called General Managers in future, a wish that will be generally shared. On almost all the larger lines there is already a special Deputy Agent to deal with establishment matters, so that the reason for the committee's recommendation that each Agent should have such a deputy is not very clear, unless it is intended to apply to all lines of whatever size. The committee rightly urges a campaign against dishonesty and incivility, but, seeing that from time immemorial these terms, as understood by most Indian subordinates, have differed in essentials from their accepted interpretations in the West, it may be some time before much improvement according to the latter standards is evident, even with the aid of intensified education and staff training. As the description of the Walton Training School on the N.W.R. in our issue of March 5 indicates, schools, courses of training, and examinations for the promotion of subordinates, are by no means neglected on all railways as one might infer from the report.

It is interesting to find the committee recommending that the whole commercial organisation should be lifted

* Summarised in the July 2 issue of THE RAILWAY GAZETTE.

out of the divisional scheme and re-organised at this stage on the departmental principle. The usual arguments in favour of the divisional system are that it secures direct personal contact, not only through the Commercial Officer, but also through the Divisional Superintendent and other officers on the spot with the local trading community, and that decentralisation empowers the Superintendent to work his division to suit the interests of that community without reference to a far-distant headquarters commercial and general organisation. In countries like India, where divisional headquarters may be 700 miles from the central divisional administration of a system, such arguments are often stressed. But against this, it has been found that on some railways these advantages are outweighed by absence of uniformity of policy and lack of drive from the centre in the divisional system, and it is probably these considerations that have influenced the committee in recommending the re-introduction of the commercial departmental system, at any rate at the present juncture. Another point of importance in the report is the caution uttered against placing too much faith in the efficacy and economy of railcar services. Some of the reasons for this are that the lives of such units and ultimate cost of repairs may prove disappointing, and that such cars are inelastic in capacity and may have to be replaced by trains on market and other days of peak loading. Meanwhile consideration of the alternatives of railway-owned bus services on parallel roads, and of light trains is recommended, until such time as railcar services now being tried in India and elsewhere may have proved their worth.

The further development recommended by the committee, of the commercial organisation, which should include a research branch, is undoubtedly desirable on Indian railways, few of which have yet gone as far in this direction as have those elsewhere, though it must be remembered that this form of development is still comparatively new in all countries. Recommendations regarding the co-ordination of road and rail transport, and road transport regulation include some interesting features. The committee considers that the railways should have full powers, on the same terms as other road users, (*a*) to run road services; (*b*) to invest money in, or enter into working agreements with road transport undertakings; and (*c*) to arrange road transport services through contractors. One recommendation that appeals to us is that for purposes of regulation and in every way except, of course, the control of rates, privately-owned freight lorries should be treated in exactly the same way as public vehicles, and that taxation of all goods vehicles should be on the basis of maximum laden weight, which in all cases should be prescribed. The suggestions for combating road competition, except in regard to railcars, follow the lines that might be expected and that have been adopted in Great Britain. A general reduction of charges is not recommended, and indeed, the committee urges that even particular charges should be reduced only when other measures to secure or retain traffic have failed. The suggestion of a Green Arrow service for India seems sound.

Measures for making the railways more popular throughout India are considered essential, and undoubtedly everything possible should be done towards this end, preferably on the lines mentioned in the report. Not the least of these is the simplification of the rates structure, a process which the committee thinks should receive special impetus from the Railway Board. One of the most important recommendations that the committee has seen fit to make is that, with two exceptions, railway amalgamations should be avoided, as the existing systems are already quite large enough. Also, although its members realise that it will be the policy of the Government of India to take over all the railways in time, the committee cannot refrain from enlarging upon the tendency of State management to cramp initiative, impose complicated regulations, involve heavy routine correspondence—the outcome largely of totally unnecessary questions in the Legislative Assembly—and to give undue prominence to the scrutiny of the collection and spending of public money which causes officers to neglect other more important duties. But for the opportunity that will arise, when the new Federal Railway Authority is set up, for freeing the railway organisations from political and bureaucratic influences, it seems that the committee would have been disposed towards a system of private management of Indian railways, preferably by companies domiciled in that country.

Though a State-managed concern, the central railway organisation should be entirely independent of the Government's general finances, to which it would make no contribution; any surplus should be used to improve services, popularise the railways, and to build up adequate reserves. In fact, the committee's object is to create a financially independent railway organisation on orthodox commercial lines, that will be better able to withstand the effects of economic and political embarrassments. As a means to this end, the committee urges that adequate provision should be made for depreciation, and considers that a normal balance of £22½ million would not be excessive. It further points to the importance of building up a general reserve fund, to a level of £37½ million, to serve as an equalisation fund for the payment of interest charges in bad years and from which any balance above that level could be appropriated for the amortisation of capital. The committee considers that if these provisions are made, and keeping in mind the continued attrition of revenue to be expected as the result of road competition and other causes, such as rates simplification, the Indian railways are unlikely to earn more net revenue than will serve to meet interest charges, and should therefore no longer be looked upon as a source of revenues for the relief of general taxation; every endeavour should therefore be made to enable them to maintain full solvency. The last subject discussed in the report is the future Federal Railway Authority and its relations with the Government of India.

The all-important avoidance of political interference with the authority, which should be equally free from administrative dictation, is specially stressed. In fact, the committee goes so far as to make the important recommendation that the headquarters of the new Federal Railway Authority should be in Calcutta, with a branch office in Bombay, in order to segregate it from the political atmosphere of Delhi and Simla, and place it in the closest possible contact with the commercial community. The Government should, the report continues, confine its interest in the railways to that of a debenture holder, seeing that no surplus is likely to be available for general revenues.

India owes a debt of gratitude to Sir Ralph Wedgwood and his committee for the thoroughness of their investigations, a debt that we hope it may acknowledge by the adoption of at any rate the great bulk of their recommendations. On the other hand, in spite of the constitution of the committee having been strongly criticised because it contained no Indian, every Chamber of Commerce and industrial body invited to give evidence, did so, both by means of memoranda and by oral evidence. The committee would have found it difficult to complete its enquiries in the short time at its disposal but for this wholehearted co-operation of the business community.

A Pioneer of High-Speed Technique

PROFESSOR KURT WIESINGER, who last month celebrated the twenty-fifth year of his association with the Technical High School of Zurich, may well claim to be a far-sighted pioneer in his plans for the reformation of railways. Although known as the author of many scientific essays, and as a lecturer on engineering subjects, including steam engines, electric traction and aircraft construction, it is on Professor Wiesinger's special gifts and inclinations as an inventor that his chief claim to notice in the world of science rests. In particular his research work into the possibilities of high speed on railways has yielded valuable data. His life work is a non-derailing high-speed train, the latest trials of which, with a one-tenth scale model, have recorded a speed corresponding to 225 m.p.h. A description of this remarkable invention and the special safety form of rail and wheel positioning adopted was given in THE RAILWAY GAZETTE of July 12, 1935. As a result of his application of airship design to railway requirements, Professor Wiesinger brought out in 1909 a light high-speed streamlined unit driven by a propeller. The design of the first super-pressure steam locomotive in the world originates from this versatile inventor, and his designs have been incorporated in products of the Swiss Locomotive Works at Winterthur. In pre-war days Professor Wiesinger constructed an airship, which led to the foundation of the Wiesinger Airship Company, a concern dissolved later as a result of the Treaty of Versailles. Finally it may be mentioned that the fundamentals of modern streamlined light-weight construction for high-speed units were embodied in a former Wiesinger patent.

* * * *

Federated Malay States Railways

THE Federated Malay States Railways run from Singapore in the South, through Johore, Negri Sembilan, Selangor, Perak, Province Wellesley, Kedah, and Perlis, to Padang Besar on the Perlis-Siamese frontier, 580 miles from Singapore. From Gemas (a junction 137 miles from Singapore) the East Coast line proceeds northwards for 328 miles through Negri Sembilan and Pahang to the port of Tumpat, in Kelantan. There is also a line of 11¾ miles from Pasir Mas to the Golok River at the Siamese boundary. Branches connect the West Coast ports with the main line. The route miles are 1,068 on the metre gauge, and 17 miles 35 chains are double track. The administration also operates railway ferry services at Prai—Penang with three ferry vessels, and at Palekbang—Kota Bharu with one ferry and two motor launches. Its other activities include road transport services and management of docks, harbours, and wharves.

The year 1936 saw the railways restored to a condition of solvency. After meeting all working expenditure, and setting aside the necessary annual provision for the depreciation of wasting assets, there remained a sum of $847,612 from all operations available for distribution to the two partners in these railways (the Federal Government and the State of Johore) as interest on the capital. The sum of $86,700 was paid to the Johore Government as rent of the Johore State Railway under the terms of the lease, and the Federal Government received $760,612. As shown in the report received from Mr. D. H. Elias, the General Manager, there was a general improvement in traffic. Passengers in 1936 numbered 6,877,055, an increase of 739,515, or 12·05 per cent., over 1935, but the $3,767,893 revenue therefrom was less by $17,114, or 0·45 per cent., on account of reductions in fares. In goods traffic revenue there was an increase of $1,200,644, or 22·78 per cent., with an increase of 23·68 per cent. in tonnage. It is still necessary to undercut road competition in goods traffic to an almost uneconomical extent, to retain the existing, and secure new traffic. The proportion of higher-rated traffic carried by rail was less in 1936 than in 1935, and the proportion of lower-rated traffic was higher, with the result that the average freight earned on goods traffic dropped from $4·05 a ton in 1935 to $3·88 in 1936. The Federal Government has at last tackled the question of regulating and supervising road traffic, and an official from the British Ministry of Transport arrived in Kuala Lumpur during the year to set up a controlling organisation.

Total railway revenue improved by $1,215,831, or 12·27 per cent., and railway expenditure (apart from the contribution of $1,713,185 to renewals) increased by only $102,412, or 0·01 per cent., bringing the operating ratio down from 92·88 per cent. to 83·65 per cent. In 1935 the contribution to renewals fund was $2,542,409. Maintenance of way and works showed a net increase of $61,466, maintenance of rolling stock a net increase of $24,907, and transportation expenses a net increase of $144,271, but in general charges there was a net saving of $126,882. The Straits Settlements dollar = 2s. 4d. In the accompanying table are shown the financial results of the combined undertaking, after including provision for renewals:—

	1936	1935
	$	$
Passenger train receipts ..	4,423,840	4,431,386
Goods train receipts	6,470,430	5,269,786
Total railway receipts ..	11,121,605	9,905,774
Railway expenditure (including renewals contribution) ..	10,825,857	11,552,669
Profit (+) or loss (−) on railway working	+ 295,748	− 1,646,895
Road transport, ferries, and harbours (net profit) ..	387,838	237,096
Rentals, interest, etc.	163,726	215,679
Net surplus (+) or deficit (−)	847,312	− 1,194,120

Among the auxiliary services, docks and harbours showed in 1936 a profit of $338,202, and ferries a profit of $53,101. On road transport there was a loss of $3,465. This service is maintained through the medium of contractors, who provide vehicles under contract with the railways. There were 163 locomotives and 6 articulated sets of rail motor coaches at the close of the year. Seven locomotives were condemned during the year. The revenue from railway hotels and rest rooms during the year amounted to $32,076. Cheap tickets of various kinds, including 1,000-mile coupon vouchers giving a 20 per cent. reduction on normal prices, continued to justify themselves. Progress on the reconditioning of points and crossings *in situ* by welding was very satisfactory. One of the interesting pictures accompanying the report shows a train of tank wagons conveying latex rubber.

LETTERS TO THE EDITOR

(The Editor is not responsible for the opinions of correspondents)

Souvenirs de Voyage

The Railway Club,
57, Fetter Lane, London, E.C.4
July 16

TO THE EDITOR OF THE RAILWAY GAZETTE

SIR,—With regard to your paragraph "Souvenirs de Voyage" in today's issue, the pilfering of towels seemed to have greatly troubled the Great Eastern Railway. I well remember seeing towels in their trains very boldly marked right across the towel "Stolen from the G.E.R." I trust this method turned out to be a preventative.

Yours faithfully,

G. A. NEWMAN

PUBLICATIONS RECEIVED

Cours de Chemins de fer : 5e Partie ; Exploitation Technique. (Railway Engineering and Working. Part 5, Technical Working.) By MM. Tuja and Marvis of the P.L.M. Railway. 11th edition, 1936. Paris : Léon Eyrolles, 61, Boulevard St. Germain. 336 pages. 10 in. × 6½ in. 211 diagrams.—This volume is one of a series from one of the many *cours*, or courses of lectures professed at some technical colleges in France, by railway officers. The volumes forming these *cours* constitute text-books covering every phase of the subject, and are valuable additions to the library of those interested in railways. The authors of the present treatise are the Chief Engineer and Assistant Superintendent in the Traffic Department of the P.L.M., and therefore fully qualified for their task. "Technical Working" (*exploitation technique*) is an expression used in France to cover all technical (as distinct from commercial) aspects of train operation. It thus includes such subjects as the layout of stations and yards, the make-up of trains, the use of tracks for different purposes and classes of traffic, traffic control systems, employment of rolling stock, uses of points and sidings and signalling arrangements.

The detailed construction of equipment, however, is not considered beyond what is necessary to understand its functions and apply it. Thus, we find the theory of the block system, track circuit, signal aspects and interlocking, for example, clearly set forth, but nothing about the design of relays, track circuit calculations, or mechanical details of interlocking mechanism. Such items come under the engineering side of the subject and are therefore treated in other parts of such a *cours*. The present volume gives a good presentation of the whole sphere of technical working, as above outlined, and, with its large number of diagrams, forms a useful general guide to French railway working, which differs in some interesting ways from British methods. For the reasons given, the engineer will not find much to help him in the book, but to the operating man it should prove instructive and useful for reference.

Elsners Taschenbuch für den bautechnischen Eisenbahndienst (Elsner's Pocket Book for Railway Civil Engineering). Berlin, S.42. 1937 : Otto Elsner Verlagsgesellschaft. 374 pp. 4 in. × 6¼ in. Profusely illustrated with diagrams and tables. Price 2.50 RM.—This publication is in its fifteenth year, and every year a choice of subjects is made to keep it within reasonable size compatible with adequate treatment. An index in the present issue gives the contents of the six preceding ones. The subject for this year is the standard point and crossing designs decided on for all new work, as far as possible, on the Reichsbahn. The greater part of the volume is taken up with schematic diagrams of the layouts for which plans have as yet to be made, with leading particulars and references enabling the standard drawings to be requisitioned from headquarters when necessary, followed by dimension diagrams of a number of layouts, with sleeper centres, lengths, and other information required by the permanent way staff. The information as a whole illustrates very forcibly the amount of standardisation work already achieved by the unified Reichsbahn in this important field. This section is followed by diagrams and dimension tables of points composed of two curved paths. There is an explanation of the principles to be observed in using the standard point designs, with diagrams showing the use of certain clamp plates in conjunction with different arrangements of point and facing point lock mechanisms, for wooden sleepered track. Other useful features are a weight-estimating table and diagrams showing how to position sleepers for various layouts, and use the ballast formation process ready to receive them. Further tables show clearances, fouling points, &c., and there is an explanation of the use of gauges to check the various dimensions in a number of typical layouts.

Engineering tables, particulars of derailers, abbreviations for permanent way parts, specifications covering the use of old stock, or used rails, with the aid of welding, follow, and instructions on how to distinguish different kinds of rail breakage, with photographs. The fixing of base plates on various sections of wooden sleeper is illustrated, and a list of key signs for various kinds of rails and various rolling mills concludes the volume. The book will, of course, be of great value to German permanent way staff and to engineers in countries using similar designs of track, but will be of less use than many other foreign publications of this type to British readers. It is produced in the same style as other Elsner publications, and is of handy size.

Jasper National Park, Rocky Mountains. — Travellers crossing Canada are being given the opportunity from June to September of leaving The Continental Limited train at Jasper station in the Rocky Mountains for short tours of Jasper National Park, a scenic wonderland as well as a big game sanctuary and tourist resort. The visitors are motored to Jasper Park Lodge, from which all-expense tours of from one to four days have been arranged. Even those staying but one day will be able to play golf on the picturesque championship course, and also to motor to Mount Edith Cavell and its Glacier of the Angels. The attractions of this 4,200 square miles of unspoiled mountain scenery, which takes in the early watershed of the Athabasca river, are illustrated in a new brochure just issued by the Canadian National Railways, who resorted to coloured photographs to portray the beauty of Jasper Park in its garb of summer sunshine. The social amenities of Jasper Park Lodge, with its log bungalows and swimming pool, are shown in a series of impressive views.

Alkaline Batteries. — We have received from C.A.V.-Bosch, Acton, London, W.3, a catalogue and handbook dealing with C A.V.-Nife (nickel-cadmium) alkaline batteries. Illustrated hints are given on the charging, installation, and maintenance of batteries composed of these cells, which are rated at from 25 to 240 ampere-hours, at a 5- to 10-hour rate. A complete range of spare parts and accessories is available.

Electrical Point Detectors.—The Siemens & General Electric Railway Signal Co. Ltd. has published an illustrated pamphlet describing tappet and direct operating electrical detectors for facing points (three-slide) and trailing points (two-slide). In the tappet type, the design is based on the familiar tappet locking principle, having contacts actuated by notched longitudinal tappets engaging with dies secured to transverse moving switch bars. Characteristics of the direct operating detectors are self-cleaning contacts and good visibility, and accessibility of all moving parts. In these instruments the contacts are directly operated from the moving slides.

A Waterproof Insulating Compound.—Callender's Cable & Construction Co. Ltd., has published a concise reference booklet for engineers, entitled "How to Use Kalanoid." This material is an insulating and waterproof compound for use in electrical wiring. It remains plastic indefinitely, and has given over 11 years of satisfactory service in all parts of the world. Kalanoid is specially prepared for filling the interior of Callender junction boxes, and for other purposes where it is desirable to exclude moisture from wiring connections. The booklet deals particularly with the use of Kalanoid in connection with the firm's own wiring equipment.

Assisi. — A handsomely-produced 32-page brochure has just been issued by the Ente Nazionale Per le Industrie Turistiche (ENIT) dealing with "The Land of St. Francis." This comes as a timely reminder that the present year marks the 600th anniversary of the death of Giotto, whose departure from the inadequacies of primitive art followed close on the heels of the introduction by Francis of Assisi of a new line of spiritual thought. The appeal of Assisi as a place of pilgrimage continues unabated, and travellers will find this brochure a beautifully-illustrated guide to the charms of this mediæval township on a hill, and also a useful indication of the means of approach and the tourist concessions offered by the Italian State Railways.

THE SCRAP HEAP

TRAIN-WRECKING AS A SUBSTITUTE FOR DIVORCE

John Nevins was a fireman on the Evart & Osceola Railroad in Michigan. A log was chained to the track one night, and his locomotive was wrecked, killing him instantly. His widow sued the company for $5,000 damages. While the suit was pending, a good-looking young fellow made her acquaintance, professed to fall in love with her, and made a marriage engagement. Having confidence in him, Mrs. Nevins told him that the log was placed on the track at her request, she desiring to get rid of her husband, while they were to have all the money that could be gained by a lawsuit. The wooer induced her to repeat the story in the hearing of two concealed witnesses, and then had her arrested. He was a detective in the company's employ. —*From "The Railroad Gazette," of March*, 12, 1880.

* * *

GROCK AT EUSTON

Apropos the attention which is being given in the daily press to the centenary of Euston station, Mr. Arthur Croxton has written to the *Daily Telegraph* as follows:—

"During the war I was privileged to provide in the shareholders' great hall at this station a remarkable concert in aid of the War Seal Corporation. Grock and Fred Emney created a sensation when they passed through the central hall of the station in their respective costumes of a French clown and an "Old Lady getting over a Stile." The entertainment we provided made history in the railway world. It was a foggy December afternoon in 1916, and the climax occurred when the fog having increased, I noticed that many passengers were held up in the great waiting-hall. A suggestion to Grock produced the answer, "Oui, certainment!" and in a few moments a piano was wheeled from the shareholders' room on to the balcony at the head of the stairs. The large concourse of travellers was dimly seen at the antics of the great mimic, who remarked to me that he had performed through the fog roaring with laughter in many queer places, but never before in a railway station waiting-hall!"

* * *

THE APIARIST'S ALARM

Anton Kertesz, a bee-keeper of Nyiregyhaza, near Budapest, as his bees had not fulfilled expectations put two swarms of them in two milk jugs, tied the mouths with brown paper, and entrained for Budapest to consult the Department of Agriculture, putting the bees beneath the seat. They managed, however, to pierce the paper and issuing forth, crept in solemn procession up the inside of his trouser leg, and no feeling of modesty prevented them from using their stings. Hot and perspiring, Kertesz requested his fellow passengers, two ladies, to leave, and they, alarmed by his desperate appearance and strange way of speaking, rose and made hasty departure. Kertesz relieved of their presence removed his trousers and shook them out of the window; they were snatched from his hands by a passing express and went flapping gaily through the countryside. Meanwhile the cry of "Madman!" has been raised by the two ladies, and the train conductor, as a precaution, promptly locked the door of Kertesz's compartment. At Budapest two muscular strangers descended on Kertesz and told him they were tailors who would measure him for new trousers. His all-too-willing trust in them was betrayed almost immediately when they forced him on to a stretcher and bound him to it. His frenzied protests earned him a strait jacket, and he was borne off to an asylum. Three days passed before the doctors were satisfied that the seat of the trouble was bees not brains.

* * *

The Monkland Canal is the oldest in Scotland and runs from Port Dundas to a point near Airdrie. It became the property of the Caledonian Railway Company (now L.M.S.R.) in 1867.

Lunch in a Shepherds Bush Scrap Yard

To assist the national campaign for the collection of iron and steel scrap, a novel luncheon was given on July 15 in the Shepherds Bush scrap yard of George Cohen Sons & Co. Ltd. An excellent repast was served to about a hundred guests in a large marquee overlooking the scrap dump. The provision of a marquee relieved the feelings of many who had imagined they would be eating in disturbingly close proximity to broken bedsteads, old iron chains and bars, and the thousand and one items regarded as scrap. Outside the tent were great vases of "exquisite blooms" cunningly contrived from steel turnings and brass rods, but inside such barbaric splendours gave place to sophisticated surroundings reminiscent of a West-End restaurant. There were, however, "ironic" reminders of the scene without in the form of posters, in the menu itself (which was printed on scrap sheet metal), and in the names of some of the dishes—"Cantaloup Chêne Rond" was, of course, an allusion to Lord Dudley, Chairman of the Earl of Dudley's Round Oak Works Limited, who presided. Lord Dudley said national campaigns arose only in times of emergency. A period of emergency had now arisen and they wanted all the scrap metal they could get. Sir Thomas Inskip, Minister for the Co-ordination of Defence, who regretted his inability to attend the luncheon, had sent the following message:—

The demand for steel from many directions is very pressing and it is essential if the full resources of the country are to be used that the supplies of steel should be not only maintained but increased. One way in which the industry can be assured of better supplies of raw material is by an improvement in the collection of scrap iron and steel, and I hope that the efforts of the British Iron and Steel Federation and the Scrap Merchants' Federation in this direction will meet with success.

It was pointed out that old iron, relegated as lumber, rubbish, or refuse, represents the ultimate equivalent of over 90 per cent. finished steel. (See our editorial of July 9.)

Un Menu Métallurgique

OVERSEAS RAILWAY AFFAIRS

(From our special correspondents)

NEW ZEALAND

Main Line Doubling

The work of doubling is at present proceeding on the main trunk line of the North Island between Auckland and Frankton junction, a distance of 87 miles. The first 19 miles from Auckland to Papagura, the end of the suburban area, are already double line, but the pressure of increased traffic has necessitated its extension through the coal-mining area to the Waikato dairying district at Frankton junction. At the same time the old track is being realigned where necessary to give easier curves and facilitate higher speeds. None of the bridges concerned has yet been widened, due to lack of steel, supplies of which are coming through slowly because of the heavy overseas armament programme. It is expected that the provision of a satisfactory road bed for the new track in the swamp country near Rangiriri and Mercer will prove difficult, as it has been found that such country requires a good deal of filling to be done before a firm foundation can be made.

A Year of Progress

The end of the financial year has shown a marked improvement in the general railway position. The Budget had already made provision for a restoration of wages to the 1931 level, a measure that cost the railways £174,000 up to March 31, 1937. But since last year's Budget was presented, there have been increases in the prices of coal and certain other materials required for railway purposes, and these increases have been fully met out of revenue without making any additional demands upon the country's financial resources beyond those provided for in the Budget. As a result the Department has had no occasion during the year to increase either its fares or rates on account of increased costs, the increased turnover having acted as an equalising factor in preserving, to a material extent, the net revenue of the previous year.

In the year under review much has been done to implement the Government's policy of making the railways serve, as far as possible, the travel and freight requirements of the public at the lowest cost to the users, consistent with reasonable pay and conditions for the employees, and such return on capital cost as was budgeted for in the financial accounts of the whole Dominion.

The railways are so closely interwoven with the general developmental activities of the country that their capital account, whilst it is kept separate for railway accounting purposes, must be regarded merely as a part of the whole of the funds invested by successive Governments for the development of the country, and, like several other portions of these funds, this railway capital has never been expected to bring back fully, in direct interest a return on the sums invested. But it has been expected to so improve the country that the people of New Zealand would be able to gain advantages from the investments to such an extent that the taxation to meet the difference between the net revenue and the total interest required would be more than justified through the benefits conferred.

Increasing Freight

The freight traffic of the railways has been increasing so rapidly in recent months that great difficulty has been experienced in meeting the requirements of shipping, mining, and the general traffic of the primary and secondary industries. Although a big programme of steel wagon construction is in hand, considerable delay in the supply of the necessary steel from Great Britain has added to the difficulties.

Easter Travel

There was a considerable increase in Easter travel by rail this year as compared with last, both in numbers and in revenue, 395,000 passengers being carried as against 340,000 in 1936, a 55,000 or 14 per cent. improvement. Revenue increased by £12,000 (or 18 per cent.) over the Easter revenue for 1936. As there has been no alteration in the scale of passenger fares, the percentages of increase indicate longer distances travelled, a further sign of the improved economic position of the people.

VICTORIA

Selector Telephone System for Melbourne Suburban Area

Progress is being made with the preparations for the inauguration of the selector telephone system for controlling train services in the Melbourne suburban area. The installation will rank as one of the most modern of its kind in the world. It is proposed to bring 220 stations, signal boxes, and depots within the scope of the system, the central point being in the new Central Train Control Division on the ground floor of the administrative offices at Spencer Street. In this way, the suburban train services will be under the same scheme of control as those of most of the country lines. A train despatcher's table, containing many important improvements upon the existing type, will be located in each of three rooms at the Central Train Control. An outstanding development is the facility under which each table will be interchangeable, one with the other: thus, if abnormal conditions occur on a particular line, the group of stations concerned can be immediately segregated to one of the tables. A further notable improvement enables the train despatcher to conduct a conversation that can be heard simultaneously by all of the 220 stations, signal boxes and depots linked with the system. In making contact with a station, the train despatcher will merely operate a press-button, following which lights will automatically indicate whether the circuit is in order to the station concerned. The train despatcher's voice will be transmitted through a microphone fitted beneath the loud speaker.

BRAZIL

North Western Railway

This railway has recently provided a medical and pharmaceutical coach for helping the inhabitants living in isolated areas in the vicinity of its various lines. In many cases these people have had no ready means hitherto of obtaining medical attention and indispensable pharmaceutical remedies. Equipped with all necessary implements, medicines, &c., and accompanied by doctors, the coach made its first trip to the State of Matto Grosso, and will continue to make periodical journeys, or special ones if required.

Estrada de Ferro S. Thiago A. S. Luiz

The 1st Railway Battalion, under the command of Colonel Horta Barboza, again began work on the construction of this line—which was referred to in THE RAILWAY GAZETTE of December 18, 1936—on April 21 at São Luiz; the work will also be undertaken from Villa Santiago.

ARGENTINA

Labour Trouble on Cordoba Central Railway

For some time past certain sections of the outdoor staff of the above railway have been agitating for the return of the wage deductions made in 1932, as the result of an agreement between the Government, the company and the labour unions. As the company was unable to accede to this demand, some of the men took the law into their own hands and declared a stoppage of two hours a day throughout the line, as from June 15, as a consequence of which both passenger and goods working suffered a certain amount of disorganisation. It should be pointed out that in acting in this high-handed and arbitrary way, the men both repudiated the presidential award of October, 1934, in regard to the wage-cuts, and defied the authority of their unions, which not only had not authorised the strike, but had advised against it.

The men's argument that the improved financial position of the railway justified the restoration of the cuts is, unfortunately, not borne out by the facts. The following statement issued by the Director-General of Railways, shows that, in spite of the improvement

in the company's gross receipts during the past year, it is estimated that the financial year ending June 30, 1937, will show a deficit of some 3½ million paper dollars.

	$ Paper	$ Paper
Gross receipts		27,850,000
Expenditure—		
Working expenses	22,000,000	
Law 5,315—3 per cent.	170,000	
Renewals ...	580,000	
Losses on exchange	1,000,000	
Interest on debentures at par rate of exchange ...	7,653,610	
		31,403,610
Deficit		$3,553,610

A deputation from the Union Ferroviaria, which called on the Minister of Public Works (Dr. Manuel R. Alvarado) for the purpose of asking him to use his influence with the company to restore the cuts, was informed that before negotiations of any kind could be entered into, the strike must be abandoned, as the Government would not yield to illegal pressure. This determined attitude on the part of the authorities convinced the agitators that nothing was to be gained by continuing the strike, which was called off on the 17th, and the men returned to work. The Minister of Public Works is reported to have stated on this occasion that the approval by Congress of the Bill providing for the purchase of the line by the Government would be the best solution to the difficulty.

INDIA

Further Notes on the Wedgwood Report

[The following notes upon the report, not already referred to in the summary on pages 10-14 in our issue of July 2, have come in from our correspondent in India.—ED. *R.G.*]

An examination of expenditure in the Accounts Department and the consideration of the extension of mechanisation both in connection with accounts proper and with the compilation of statistics are recommended. The apportionment of revenue between State-owned railways on broader principles is also suggested.

The extended purchase of railway stores through the Indian Stores Department is recommended, as also the conduct of extended research jointly by the Indian Stores Department and the Central Standards Office of the Railway Board. The existing system of statistics should be reviewed with the object of increasing their usefulness, and the strengthening of the statistical organisation of some railways from the point of view of interpretation is suggested.

Senior Commercial Officers from the U.K. Advocated

In connection with the selection and training of commercial staff, the desirability of appointing at the outset senior men from Great Britain should be considered, states the report.

Though no general raising of rates is recommended, it is considered desirable that the surcharge on coal should be raised from 12½ to 15 per cent., and the report also touches upon the question of a protective duty on South African coal as an alternative to the existing rebate on railway charges for Indian coastwise coal. The committee also examined the effect of charging upon "discontinuous" mileage, and recommend that hard cases be dealt with by the quotation of station-to-station rates.

To popularise the railways throughout India, it is suggested that information offices should be established at the main centres of population to maintain adequate contact with the press, both English and vernacular, and that a journalist should be brought out from England to develop the idea.

FRANCE

Railway Tariffs Increased

French railway fares and freight rates are being raised in connection with the Government's programme of increasing taxation and public service charges to strengthen the country's financial position. Decrees imposing the increases were published in the *Journal Officiel* of July 9. Fares are raised 5, 6, and 7 centimes a km. for third, second, and first class tickets respectively from July 20. Some exceptions are allowed in regard to the date for applying the increases. The old tariff will be maintained until September 30 for the popular holiday tickets issued under the new social laws for workmen and their families, and this also applies to cheap tickets for large families. The increase will be postponed until January 1 for the cheap tickets instituted on July 7 for the benefit of certain small farmers.

Freight Rates Raised 18 per cent.

A general rise of about 18 per cent. in freight rates was decreed to come into force on July 12, but, in order to check the rise in the cost of living, advances in freight rates are on a more moderate scale for the transport of livestock and farm produce, especially grains, potatoes, fresh fruit, wine, cider, and perry. Further, the proposals put forward by the railway systems in June for the reform and simplification of the tariff schedules are to come into force as soon as possible. For this purpose, the Railway Tariff Commission decided to meet on July 16, and to complete its investigation by August 15 in order to make the necessary changes.

Higher fares and freight rates are expected to bring in additional annual revenue of fr. 2,600,000,000, or more than £20,000,000. Of this estimate, the sum of fr. 2,000,000,000 is based on increases coming into force immediately, and it is anticipated the remainder will be raised by measures enforceable not later than August 16.

Reorganisation and Co-ordination

At a recent meeting of the Cabinet it was decided to proceed immediately with plans for the reorganisation of the railways and for general rail and road co-ordination. To secure co-operation between the various governmental departments concerned in this matter, a Cabinet committee was formed, comprising the Premier, the Vice-Premier, and the Ministers of Finance, Public Works, Commerce, and Labour. The Ministers will investigate the conditions for the reorganisation of the railways. A plan for this purpose is under consideration by the Conseil Supérieur des Chemins de Fer.

Transport Licences

In order to prepare for effective rail and road co-ordination and to prevent road transport from profiting unduly by the higher freight charges on the railways, the Decrees instituted increased taxes on motor fuels and also a system of licences for public and private transport. The licence fee for goods transport is fr. 500 a ton. For passenger transport, the licence is fixed at fr. 125 a seat.

Vehicles operating only in one department or subsidised motor buses serving towns in two adjoining departments are exempt from the licence fee. Vehicles circulating only within their own department and adjoining departments pay 50 per cent. of the tax. A reduction of 50 per cent. is also allowed for vehicles operated by gas producers, compressed gas and electric accumulators. Gas producers are exempt for the first two years. Twenty-five per cent. of the revenues raised by these taxes are allocated to the departments. Taxes are also imposed on oils, gas oil and benzol used by lorries.

DENMARK

The Storstrøm Bridge

As recorded in a news paragraph last week, the Storstrøm bridge (described in THE RAILWAY GAZETTE of March 20, 1936) is to be opened on September 26, the birthday of King Christian. This bridge, which is about 3,200 m. (2 miles) long, is rapidly approaching completion. The contractors are Dorman, Long & Co., Ltd., of Middlesbrough, in co-operation with Christian & Nielsen, of Copenhagen. The Danish firm is in charge of the foundations and all work on the shores, including about 10 km. (6 miles) of concrete roads; while the British firm is carrying out the steelwork. The bridge will be completed earlier than was expected, the State Railways being anxious to have it ready for traffic when the winter timetables are introduced on October 1. Some small expenses—about 20,000 kr.—incurred by the sub-contractors in advancing the work will be covered by the State. The cost of the bridge and adjoining roads and railway work will be about 40,000,000 kr. (£1,134,000).

THE CENTENARY OF EUSTON

(*See illustrations on pages* 156 *and* 157)

ALTHOUGH various sites were considered for the original terminus of the railway to Birmingham (as outlined in an editorial note on page 138), Euston was selected in the Bill introduced in 1832 which was rejected by the Lords.

When the scheme was again brought before Parliament in the following year, the London terminus was fixed at Camden Town, about a mile north of Euston Square. This Bill received the Royal Assent on May 6, 1833, and incorporated the London & Birmingham Railway Company. Almost immediately, however, the newly-formed company took steps to revert to its originally proposed terminal at Euston, and in 1834 the Great Western Railway, which was then in course of promotion, decided to effect a junction with the London & Birmingham Railway "in a certain field lying between the Paddington canal and the turnpike road leading from London to Harrow in the parish or township of Hammersmith." From this point, which was, of course, in the vicinity of the present Willesden Junction, the G.W.R. would have exercised running powers into Euston. The London & Birmingham Railway had already secured an Act on July 3, 1835, authorising the extension from Chalk Farm to Euston, nearly two months before the G.W.R. received its Act of incorporation for a line making the junction indicated.

The amount of land acquired by the London & Birmingham Railway for its terminus was nearly twice as much as was actually put to profitable use in the original station, as the breakdown of the proposed arrangements with the G.W.R., and the adoption by that company of Brunel's 7-ft. gauge with a separate terminus at Paddington, resulted in the L. & B. finding itself possessed of enough land to accommodate two railways whereas only its own traffic was actually handled. Moreover, four tracks were laid between Camden and Euston from the first, but the two easterly tracks (now the up fast and up slow) were used by the L. & B. trains and the westerly pair (down fast and down slow) that were intended for G.W.R. trains were little used until regular locomotive working was adopted on the Camden incline.

The original Euston Square station was planned by Robert Stephenson and the architectural work was superintended by Philip Hardwick, junior, one of the noted architects of the time. The actual opening to public traffic, of which the centenary fell on Tuesday of this week, took place on Thursday, July 20, 1837, when the first section of the London & Birmingham Railway (between London and Boxmoor) was opened to the public with three trains a day in each direction. The company advertised the following accommodation on the trains:—

> First class coaches carry six passengers inside and each seat is numbered.
>
> Second class coaches carrying eight passengers inside, and are covered, but without lining, cushions, or divisions, and the seats are not numbered.
>
> Third class coaches carry four passengers on each seat, and are not numbered.

At this time, the frontage of the station was not finished and even when the railway was extended to Tring on October 16, 1837, and thence to Denbeigh Hall on April 9, 1838, some of the work still remained to be completed. The frontage design comprised four lodge-type buildings (of which three are still, of course, *in situ*) joined by wrought iron gates on some of which the coat-of-arms of the London & Birmingham Railway is still clearly discernable. Between the two middle lodges were entrance porticos surmounted by Hardwick's famous masterpiece, the great Doric arch. This was built of stone hewn at Bramley in Yorkshire and the largest individual stones weigh 13 tons; the diameter of each column is 8 ft. 6 in. and the height 27 ft. 6 in. Considerable discrepancies are to be found in published reports of the cost of this famous arch, but according to the records of the L.M.S.R. the figure was £35,000. Actually, the great Doric arch was completed in May, 1838, and was originally in substantially the same condition as at the present time excepting that the glided word "Euston" was not inscribed until 1870.

The departure and arrival platforms were each about 420 ft. long, and were roofed over for part of their length only; communication between the two platforms, the intermediate sidings, and the original carriage shed was by means of "turnplates" (turntables) only. The departure platform is today No. 6, and the present stationmaster's office on No. 6 marks the site of the original refreshment buffet provided soon after the station was opened. Drawbacks to the extension of the original line into Euston was the operating difficulty occasioned by the Camden inclined plane, one of the most famous of British railway "banks." It starts almost at the platform end and extends for 1¼ miles to Camden No. 1 box, with principal rising gradients of 1 in 70, 1 in 112, and 1 in 77. It was impossible to avoid so steep a gradient, as the Regent's Canal had be crossed by an underline bridge at the first mile post, and (as was the case at Lime Street station, Liverpool, and elsewhere) it was deemed inadvisable in the early years of the line to employ locomotives on such gradients.

When the line was opened, the stationary winding-engines at Camden (each of 60 h.p.) were not ready, and "a powerful engine" (*sic*) was hired from Robert Stephenson & Co., of Newcastle, apparently for banking up to Camden the hired Bury locomotives which worked the traffic at the start. It was not until October 14, 1837, three months after the inauguration of a regular service, that the winding system was instituted, and this continued until July, 1844. The endless rope, to which the trains were attached at Euston for the ascent to Camden, was 4,080 yd. long and 3 in. thick. The condensing engines for winding purposes were supplied in 1838 by the well-known firm of Maudslay, Son & Field, who also supplied about the same time some "six-coupled luggage engines" to Bury's design, for traffic on the L. & B. Engines were detached from up trains at Chalk Farm, and the trains lowered into Euston; their speed (which was not supposed to exceed 10 m.p.h. normally, and less when the train was heavy or weather bad) was regulated by brakesmen known as "bankriders."

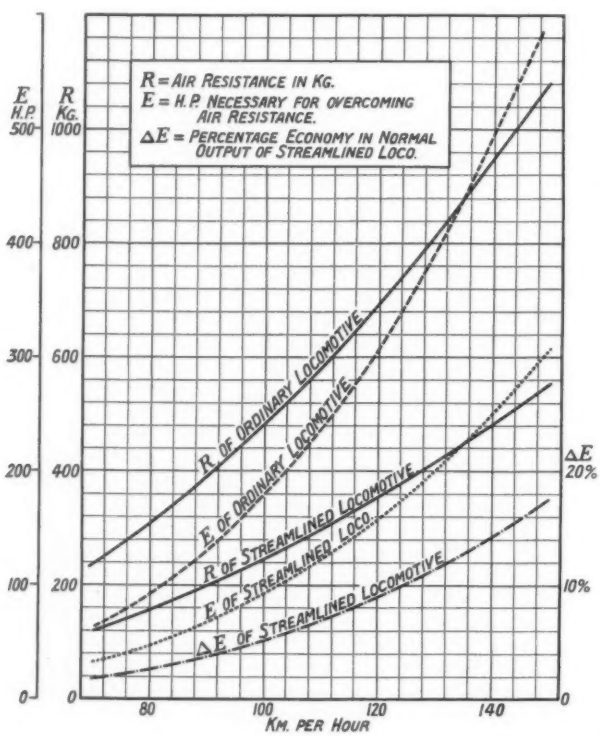
The line was completed and opened throughout to Birmingham on September 17, 1838, and, as the Grand Junction Railway (the opening of which was referred to in a leader on page 4 of our July 2 issue) provided the link thence to Liverpool and Manchester, Euston immediately assumed its destined role as the first gateway to the Midlands and the North. The opening of the original Midland Railway system in 1839-40, relying on the London & Birmingham for access to London, increased the importance of Euston, and, although later routes to King's Cross and St. Pancras took much of this traffic away, it was more than replaced by expansion of L.N.W.R. traffic proper. The L. & B., Grand Junction, and other railways were, of course, merged into the L.N.W.R. on July 16, 1846. Full details of "The Story of Euston" are being given in a series of articles Mr. D. S. Barrie is contributing to *The Railway Magazine*.

NEW 4-6-2 TYPE STREAMLINED LOCOMOTIVES, POLISH STATE RAILWAYS

Specially designed for high-speed working. Wind-tunnel tests on models indicated the advantage of streamlining

THE first of a new series of 4-6-2 type two-cylinder streamlined locomotives, to be known as the Pm.36 class, has been built for the Polish State Railways at the Chrzanow works of the First Locomotive Works of Poland Ltd., for the haulage of trains weighing 300 tons at 140 km.p.h. (87 m.p.h.) on level straight track. The boiler, which has a round-topped firebox casing and sharply inclined throat and back plates, is built of two rings, the rear one having a diameter of 5 ft. $3\frac{13}{16}$ in. The distance between the tubeplates is 19 ft. $8\frac{1}{4}$ in., and there is a 30-element superheater. Carbon steel plates with copper staybolts are used for the boiler and firebox.

The engine illustrated on page 158 has an ordinary single chimney and blastpipe, but the second locomotive of the series will have a double chimney and blastpipe, and tests will be made to decide which form of draught is to be applied to further locomotives of the series. Steam distribution is effected by means of Heusinger valve gear actuating 11-in. diameter piston valves having a maximum cut off at 80 per cent. The crossheads are of the two-bar type and forced lubrication is applied to the gudgeon pins and slidebars, the lubricant being delivered through orifices bored in the pins or in the slippers of the crosshead. The big ends of the connecting rods are fitted with bronze bearings lined with white metal, adjustable wedges being used. The coupling rods have one-piece bronze bushes lined with white metal.



Results of wind-tunnel tests on streamlined and ordinary locomotive models

The axleboxes of the 4-wheeled leading bogie and of the 2-wheeled trailing truck, are equipped with SKF roller bearings. The side movement of the leading truck is $3\frac{5}{8}$ in. in both directions, return action being controlled by laminated springs having an initial tension of 800 kg. (1,764 lb.) rising to 3,400 kg. (7,496 lb.) at maximum side movement of the truck. In the case of the trailing truck, the side movement allowed is $3\frac{3}{16}$ in. on either side, the return action being governed by spiral springs. A system of spring compensation is provided between the coupled wheels and trailing wheels. The axles of both trucks are of nickel-chrome steel.

A new type of 8-wheeled tender is used, the bogies of which are designed for easy riding at high speed. To shorten the braking distance at speeds over 110 km.p.h. (68 m.p.h.) a brake has been installed which regulates the pressure on the coupled wheels in accordance with the speed, and on the tender wheels in accordance with the speed and the amount of water in the tanks. The leading bogie wheels are also braked.

The streamlining on the locomotive and tender has been designed in accordance with the findings of the Aerodynamical Institute of Warsaw, where precise comparative wind tunnel research was applied to models of streamlined and ordinary locomotives. The results are indicated in the accompanying chart. The covering in of the gap between the locomotive and tender was shown to give an appreciable advantage and was effected by making the entrance to the driver's cab on the tender and not on the locomotive itself. The upper part of the tender is completely covered, and its rear portion narrowed. There is a large opening in the roofing of the tender through which the coal is loaded, and when not in use, this orifice is closed by two flaps which are moved either towards the front or rear during the coaling operation, thus affording access to the fore or hind part of the bunkers. The tanks are filled through openings in the side plates which, when not in use, are covered with flaps.

The following are the leading particulars of the locomotive and tender:—

Cylinders, diam	530 mm. (20$\frac{7}{8}$ in.).
Piston stroke	700 mm. (27$\frac{9}{16}$ in.).
Wheels, bogie	1,000 mm. (3 ft. 3$\frac{3}{8}$ in.), diam on tread.
,, coupled	2,000 mm. (6 ft. 6$\frac{3}{4}$ in.) ,,
,, hind truck	1,200 mm. (3 ft. 11$\frac{1}{4}$ in.) ,,
Boiler, heating surface:	
Tubes and firebox	198 sq. m. (2,133 sq. ft.).
Superheater	71·2 sq. m. (766 sq. ft.).
Combined heating surface	269·2 sq. m. (2,899 sq. ft.).
Grate area	3·86 sq. m. (41·5 sq. ft.).
Boiler pressure	18 atm. (264 lb. per sq. in.).
Tender:	
Tank capacity	32 cu. m. (7,050 gals.) water.
Coal capacity	9 *tonnes* (8·86 tons).

The weight of the engine in working order is 94 *tonnes* (92·5 tons), and the tender 70 *tonnes* (68·9 tons), making a total of 164 *tonnes* (161·4 tons). The equipment of the locomotive includes a coal pusher in the tender.

After successfully passing a few trial trips in Poland, the locomotive was sent to the International Exhibition in Paris where it is now on view.

THE DESIGN AND OPERATION OF CAPSTANS—I

Characteristics of shaft-driven, hydraulic, and electric installations and types of capstans used with these systems

By B. J. DALZIEL, Late Assistant Electrical Engineer, L.M.S.R.

OF all railway machines devised to facilitate the operation and handling of traffic, and to promote economy in engine power and labour, the capstan is the most widely and continuously used. The earliest movement of wagons on rails was by means of horses, and horse power continued to be used for short haul and shunting movements after the adoption of steam locomotives for main line and other long haul work. The capstan was devised to provide a more powerful and cheaper alternative to animal power where the volume of traffic required extensive use of the latter, and later, capstans were installed to reduce locomotive shunting in still larger yards.

Under more modern conditions of design and layout of yards and warehouses, it was normal to instal capstans to cover the working of traffic into and out of loading (or outwards), unloading (inwards), and storage roads; the layout of the roads and their capstans was in general combined with that of turntables and traversers, so as to enable the wagons to be moved in a continuous circuit, and avoid obstruction by any wagon having to go back on its tracks. Such a layout frequently involved the installation of capstans in considerable numbers, and in practice many such capstans were used only very infrequently. It must be remembered, however, that in many cases the roads provided with such capstans would be useless without them. All such layouts are in the first stages necessarily devised to a great extent in the dark as to what the actual working conditions may turn out to be. Moreover these working conditions may, and indeed almost always do, change. The existence therefore in any yard of some amount of traffic handling machinery rarely or never used is inevitable, but it is not always—though frequently it is—the case that such machinery can be pulled out with advantage. One result of the use at irregular intervals of certain machines in a yard is that as a rule, the working load of the yard in energy demand arises from a comparatively small number of the total machines installed, a fact which is, and has been, of material assistance in connection with modernisations such as are referred to later.

Up till recent years the prevalent form of capstan has been hydraulically driven, but there have been some extensive examples of an earlier form of drive, namely, installations of a dozen or more capstans worked, through long lines of shafting placed underground, from a central steam engine. Of late years electric capstans have been installed almost exclusively; indeed, as much as 20 years ago some of the more progressive railways were installing electric capstans for new work in preference to hydraulic, although their existing installations were hydraulic.

Some shafting installations are still in operation, but the power consumed in such cases is a heavy item. Not only is the installed h.p. of the central driving engine necessarily considerable, but the continuous demand on it for constantly running shafting is very much heavier than the mean demand that would be set up by an equal number of hydraulic or electric machines. Nevertheless, especially where other steam operated plant forms part of the same installation and is supplied from the same boilers, and where coal is relatively cheap, it is not so easy as would appear to justify the outlay required to change over to, say, electric operation. Such outlay mounts up surprisingly where the number of capstans involved, with possibly associated machinery, is large, and the percentage return on it given by the value of the resultant saving in labour, fuel and maintenance, may be disappointingly low. The maintenance item of shafting installations in particular, considering the long lengths of shafting involved, is mostly surprisingly low.

Shaft-driven capstans are, of course, the essence of simplicity. The control gear, if any, is simply a mechanical clutch, but as a rule such capstans do not comply with the requirement that they should stop within 1½ revolutions of the bollard when the operating treadle is released. In some cases, even, the bollards rotate continuously.

Hydraulic Capstans

The introduction of power distribution by high-pressure water rendered possible the installation of much larger numbers of individual machines in goods yards. In the light of modern standards and methods, such installations were, in fact, frequently overdone. The characteristics of hydraulic capstans render them eminently suitable for the work they have to do, as they quickly respond to increase of pull by slowing down, thus easing snatch on the ropes and obviating breakages; also they are their own very effective controllers of overload, for their pull is strictly limited in proportion to the water pressure and the area of the operating rams. On the other hand they are very heavy consumers of pressure water; as the cylinders have to be filled to capacity each working stroke, there is no correspondence between pressure-water consumption and load. The lighter the load, in fact, the more water they consume, and their heaviest consumption is at no load at all. Also, as they haul through distances far greater than those of, say, the lift of a crane, their load is more prolonged and sustained. In an average goods yard the capstan load is that which usually sets the standard for work on, and capacity of, the pumps.

Nevertheless, from the point of view of utility, reliability, and general fool-proofness, the hydraulic capstan is a very effective machine, and its operating features fit the work very closely. Thus, it is started by the simple depression of a foot pedal, the release of which stops it, as is requisite for safety, with certainty in less than the 1½ rev. prescribed by regulation. Some operators have regulated the speed of rotation by graduated depression of the foot pedal, but the writer is not aware that this has ever been an official requirement either on hydraulic or electric capstans. The automatic variation of speed inversely with the load, and the definitely limited haulage and overload capacity of the hydraulic capstan, are very desirable and important features in practical yard operation.

Electric Capstans

It is always a moot point whether the operating technique of the staff should follow, and be designed to make the most of, the characteristics of machines, or whether the machine should be devised to meet existing technique. This, however, applies only in the initial stages of evolution, and as the operating technique of the hydraulic capstan is so well fitted to traffic requirements, any

substitute must be devised as far as possible to retain those characteristics. It might of course be that other methods of traffic operation could be devised which would be equally efficient, but it is certain that, besides altering the ideas and point of view of the staff, their adoption would require a radical re-construction of sidings and tracks laid out for capstan operations. The standard for the electric capstan was thus set. Of course where the entire reconstruction of a yard is in contemplation new types of machinery, including capstans, can, if they commend themselves, be adopted with greater facility. The operating characteristic of the hydraulic capstan type would still, however, be that most suitable for the movement of traffic whatever the actual capstan used.

The first electric capstans were devised in the days when d.c. distribution was prevalent, and were driven by motors with predominating series windings and even, in some cases, by straight series motors. This type of motor gave to some extent the hydraulic capstan's characteristic of speed falling inversely with increase of load. On the other hand these motors have a very high overload capacity, and overload has to be prevented by a release circuit breaker. The motor has to be started gradually through a multi-step rheostat; and rotation is stopped on release of a pedal by a solenoid-operated automatic brake.

In early days braking was sometimes effected by reversing the field and short circuiting across it and the armature in series, thus obtaining a dynamic brake; but this was not a very satisfactory arrangement as it did not necessarily stop the bollard, and did not hold it positively when stopped; with a quick thread worm drive the bollard could be driven in either direction by pull on the rope when the latter was intended to stop and hold wagons. The bollard was usually driven through worm gearing, a practice still general, but with improved worm gearing having ball or roller thrust bearings.

Where d.c. distribution prevails, capstans similar to these are still in use and being installed, with, of course, some improvement on early designs. For example, the rheostat switch was in most cases directly operated by the downward thrust of the foot pedal against the resistance of a dash pot, which was free in the return direction. As the transition from contact to contact was not quick and definite, there was much sparking and burning on the contacts, and unless the rheostat coils were made sufficiently heavy to carry the current continuously, when the operator, carelessly or otherwise, depressed the pedal only partially, some of these coils were liable to be overheated and burnt out. The maintenance cost of these capstans was accordingly heavy.

Later, the action of the pedal and dash pot was modified so that the former could be depressed fully at once, so removing some of the likelihood of trouble from careless operation. The contact arm was then moved across the stops by a weight, which was released by the depression of the pedal, the resulting motion being dash-pot controlled. This did not prevent incomplete depression of the pedal, and was therefore only a partial improvement. Later there was embodied in some railway-built d.c. capstans a starting arrangement under which the moving arm was weight-operated as just described, but traversed a series of small contacts, each carrying only the current for one of a suitable number (4 to 6) of separate solenoid-operated contact switches of circuit breaker type dealing with the main current and the cutting out of rheostat sections. This, eliminating any possible hang-fire between switch contacts and rheostat sections, and ensuring quick and clean make and break on the contactors effecting each change of conditions, considerably reduced switchgear maintenance, lightened the pedal weight and, in consequence sometimes enabled the solenoid operation of the mechanical brake to be replaced by direct mechanical operation of a brake weight.

The amount of switch and other electrical gear in these d.c. capstans still makes them costly relative to hydraulic capstans in the first instance as well as in maintenance. As capstans they are satisfactory; they are fairly free from snatch, because the characteristics of the series or compound wound motors follow to some extent those of the hydraulic capstan; this also makes them fairly well suited to varying conditions of load where heavy starting torque and a heavy pull at fairly slow speeds are required. They also suit traverser and turntable conditions where a fast speed on light load is necessary, especially in the case of traversers where the wagons have to be propelled on to the tables up ramps.

(*To be continued*)

SOME ASPECTS OF AIR-CONDITIONING

(*From a correspondent*)

THERE are over 8,000 air-conditioned coaches running on the railways of the United States and Canada. As compared with these figures the number operating in British and Dominion territories is very small, but in view of the increasing interest which is now being taken in scientific ventilation throughout the Empire, the time seems opportune to examine some of the practical problems which confront those administrations which have under consideration air-conditioning as a means of encouraging travel by rail.

It is necessary to repeat that by air-conditioning is meant the control of temperature, humidity, movement, and cleanliness of the air, with the object of establishing a comfort zone bearing a suitable relationship to external conditions and to the clothing normally worn by the passenger.

Under this definition there are two zones, a winter and a summer zone. Thus, railways operating in a temperate climate must provide equipment which is capable of establishing comfort during the varying seasonal changes. In the United States these conditions have been satisfactorily attained, but it does not follow that American practice and experience can necessarily be adopted or relied upon in other countries.

A report recently issued by the A.A.R. Division of Equipment Research includes a typical graph showing temperatures and humidities obtained in an air-conditioned car under summer conditions. External temperatures vary from 65° F. at night to 90° F. at midday, while relative humidities range from 70 per cent. to under 20 per cent. The necessity for temperature control is stressed in the report, which also states that " most authorities agree that some type of humidity control is advisable." From the above, the deduction is that dry climates predominate in the U.S.A.

But such conditions do not necessarily apply in tropical regions. Humidity control is not only advisable but essential in cases where the relative humidity ranges from 70 per cent. to 95 per cent. Neglecting absorbents, effective reduction in moisture content can be secured only by a drop in temperature. Low temperatures, however, are undesirable in such circumstances as when a passen-

ger on entering the coach is himself sticky, and feels cold due to the evaporation of moisture from his skin. In these cases reheating of the air is necessary to establish the correct relationship of temperature and relative humidity. The case for humidity control is strengthened when railways operate between a hot damp coastal belt and a hot arid interior. Mere thermostatic command is not adequate, and it should not be beyond the wit of man to devise an instrument to control the precipitation of moisture in accordance with the relative humidity of the incoming air and the desired relative humidity at the temperature as finally established by the thermostat.

For reheating, steam is not usually available except on railways which experience a winter season. Electricity can be used but this implies a further demand on the generating and battery equipment. No doubt attention will be given to the utilisation of waste heat, extracted from the entrant air, which must in turn be rejected by the refrigerant in order that the cycle of operation may be maintained.

The type of equipment to be adopted may also present a problem for which a satisfactory solution must be found. The ice system is the cheapest to instal, and may be adopted where the period over which cooling is required is short. At moderate speeds consumption is about one ton of ice per hundred miles per coach. For long trips weight becomes a factor and there is little or no reserve to cover a prolonged train delay.

Steam operation is advantageous on railways experiencing a winter season. In the tropics its adoption requires the piping of a considerable number of vehicles if marshalling arrangements are not to be inconvenienced. Electro-mechanical equipment is generally preferred. The first cost is high, but according to the report referred to above it is, in the United States, the cheapest to operate, standing charges included.

Attention may here be drawn to the possibilities of a diesel generator for providing current to drive refrigerators and fans. For individual coaches such a system would provide no advantages, any saving in weight being counterbalanced by reduction in paying load space. But when two or more coaches are to be treated the common generator system is worthy of consideration. By the abolition of axle driven dynamos and of batteries, considerable weight and capital cost are saved. Train resistance is decreased, and the locomotive has no longer to provide the energy for air-conditioning and lighting. By placing the prime mover in an adjacent brake van running as part of the make up of the train no passenger space is lost, and no vibration felt.

It is not every "pioneer" railway which may require to air-condition more than one vehicle, yet the economic and practical features of the common generator system may lead to a revision of ideas. For special luxury trains, as for instance the Bombay—Calcutta Mail, the central principle is ideal and it is possible that air-conditioning on these lines may develop the use of the one class train. Lighter loads and higher average speeds within the maximum limit may, even with supplementary fares, provide a strong weapon for use in competition with roads.

The common generator system also provides an attractive means of air-conditioning sleeping and restaurant cars, or alternatively gives an opportunity to extend economically the amenities to second class accommodation. On such railways the dining car is in itself a problem, providing as it usually does a spare seat for passengers who have accommodation elsewhere. No extra revenue is secured to offset the additional cost. Yet no one who has had experience of air-conditioning will wish to take his meals in a vehicle which is not so treated. The solution may be an air-conditioned buffet car providing permanent seating and simplified menus to permit of easy service in adjacent conditioned coaches.

The movement of the air within the coach also requires attention. Makers of equipment design circulating grilles and exhaust vents to suit the desired rate of velocity and change of air, but their efforts may be nullified by unsuitable seating or even by passengers' light baggage. Any restriction in the return flow of the air results in an increase in temperature and in the volume discharged, thus throwing an increased load on the equipment. Seating should be as open as possible to prevent the formation of dead pockets, and passengers should be discouraged from taking into the carriage bulky luggage likely to restrict air movement. Sleeping cars of the cabin type present a special problem. It is undesirable to place open grilles in the partitions separating adjacent compartments, while openings to permit the circulation of air must be placed where they will not be covered by the belongings of the occupants. In this case it would appear simplest to treat the side corridor as a duct for the return air, the admission grilles being placed in the ceilings of the cabins themselves but not, preferably, immediately over the berths.

Finance is of course an important factor, but questions raised under this head can be solved only in the light of local conditions. Nevertheless it is believed that the comfort offered by a properly equipped coach, consisting as it does of cleanliness, quiet, and equable conditions, will rapidly attract passengers either from the roads or even from a cheaper class. There is little doubt that air-conditioning has come to stay, or that it can attract revenue proportionately greater than the cost of providing and operating the equipment.

An Annual "Railway" Festival

The three towns of the Spen Valley of Yorkshire—Heckmondwike, Liversedge, and Cleckheaton—have often had the same finger of derision pointed at them as had made their sister towns of Wigan and Oswaldtwistle in Lancashire blush before the world. But though the fame of the latter towns may rest upon such strangely assorted things as tripe, town halls, and non-existent piers, the Spen Valley towns had a more concrete claim to fame—they possessed an annual festival, and a railway one at that. According to Grinling's "History of the Great Northern Railway," this festival (which was so called by Mr. Oakley, the General Manager of the G.N.R.) was really a deputation from this district, which every year from 1876 to 1881 made a pilgrimage to King's Cross to press the G.N.R. to build a line from Batley up their valley. The G.N.R., however, being guided at that time by the spirit of extreme caution, turned a deaf ear to these petitions. In the summer of 1881 the Spen Valley annual festival recurred three times over, a separate deputation coming from each town. This time a much more willing ear was lent to the exhortations of these persistent visitors, and the outcome was that a Bill was deposited for the session of 1882 for a branch line up the Spen Valley to serve the three towns. Owing to opposition from the L.Y.R., the necessary powers were not obtained, however, but arrangements were made with this latter company whereby the G.N.R. acquired running powers over the L.Y.R. Calder Valley line between Wakefield and Halifax and over its Cleckheaton and Heckmondwike branch. In return the L.Y.R. received running powers over the G.N.R. and M.S.L.R. joint line from Wakefield to Doncaster. Several new junctions were agreed to be made, and as the cost of these junctions was estimated at £150,000, whereas a new line would have cost the G.N.R. £500,000 at least, this arrangement was quite as welcome as the approval of its own line would have been.

NEW WEED-KILLING TRAIN, SOUTHERN RAILWAY

After prolonged experiment and investigation, a new weed-killing train, which is claimed to be the most efficient in the world, has been set to work

ABOUT 1,000 miles of track per annum are treated with chemical weed-killing solution on the Southern Railway. Any form of arsenical mixtures are unadvisable for this purpose and exhaustive experiments and research have been made in order to evolve the most satisfactory chemical. In 1931 the first weed-killing equipment was constructed and used. This consisted of two old tenders coupled together, with sparge pipes at each end, the solution being fed by gravity. The range of the train was 5-6 miles at a speed of 7-8 m.p.h. at one filling of weed-killer. The chemical was supplied in powder form in drums and mixed by hand with paddles. A store of drums was kept on the tender and in the guard's van. The results were sufficiently successful to warrant further experiments.

For the 1932 season, the sparge pipe was fitted with roses, and steam ejectors were supplied to assist the output of the mixture and to overcome the poor flow when the tanks were nearly empty. Steam was also used in addition to the paddles for agitating or mixing the chemical and water. From time to time further improvements were introduced, and the mileage which was chemically treated increased. It took 4½ to 5 months to carry out the season's programme, and with the further electrification of main and branch lines it became increasingly difficult to work the train owing to the intensive traffic.

In 1935 the Chipman Chemical Co. Ltd. supplied an equipment mounted on a Southern Railway truck. This consisted of a pump geared to the axle, the solution being pumped through special nozzles in the correct ratio according to the speed of the train. The pump was connected to four tank wagons by a pipe under the train; the chemical was delivered in liquid concentrate form in similar tank wagons and blown over in measured quantities by compressed air, which was also used for agitating the mixture. A spare tank of concentrate was carried on the train. The speed of the train was from 15-18 m.p.h. with a range of 25 miles at one filling. It took 3½-4 hr. to fill up the train at night ready for working the following day. This equipment was used on the main and branch lines whilst the old gravity equipment was relegated mainly to sidings.

After a season's successful working the possibility of certain improvements became apparent, the first being that with increased speed and range and size of the train, vacuum brakes were desirable. So for 1936 it was decided to use four old vacuum fitted locomotive tenders in place of the tank wagons, the spare tank wagons and goods brake vans being fitted with through vacuum pipes. Rail guards were also provided to prevent any spray getting on to the rails. Head lamps were fitted for night spraying.

Even with these improvements it was still not possible to cut the working time down sufficiently to enable the train to carry out the whole of the programme during the period when the weeds were most vulnerable, *i.e.*, before seeding. The real limiting factor was the time required for and the difficulty of getting a large volume of water, particularly during the peak traffic periods in the evening, together with the time occupied in pumping over, measuring and mixing the chemical in the right proportions, and it became apparent that even if improved methods of doing this were introduced the time taken could not be materially reduced.

The design and operation of practically every weed-killing equipment in existence both at home and abroad were studied, and whilst it was found that most railways were using weed killers containing sodium chlorate in some form, and that practically all used pumps, they all appeared to have the same difficulties as regards the speed and range of the train.

It was apparent that if the train could take water during its run, wherever there was opportunity to get under a water crane, the delay caused by taking the whole of the water at one time for the complete run would be overcome, and further, the length of the run could be much increased. If, then, the chemical and water could be carried in separate tenders, water could be taken whenever the opportunity occurred. It was, therefore, decided to construct an equipment with two pumps so that the water and chemical should be brought separately from the tenders to a mixing chamber in the pipeline leading to the sprayheads, instead of as before, being mixed in the tenders.

The new train, claimed to be the most up-to-date and efficient weed-killing train in the world, is made up of eight vehicles, as follows:—

1 goods brake van.
3 tenders containing enough chemical concentrate for 128 miles.
3 tenders containing enough water for 40 miles.
1 six-wheeled equipment van.

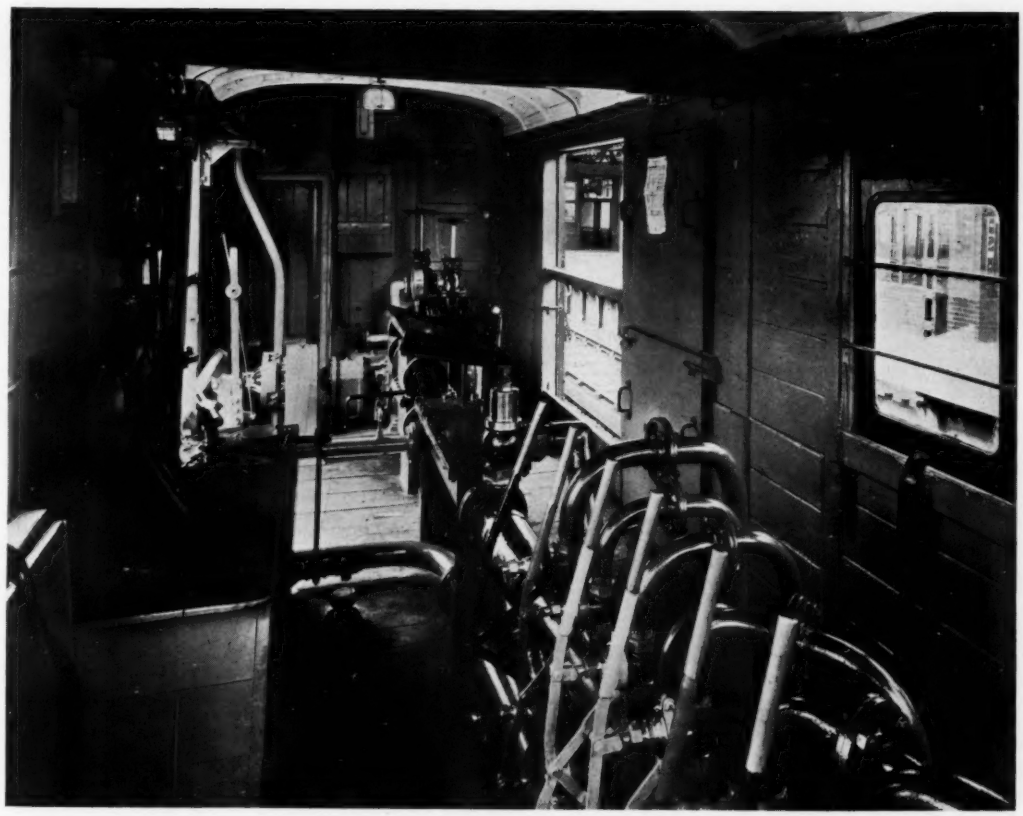
The equipment consists of two Drum metering pumps geared together in the ratio of 3 to 1 and driven through a clutch and countershaft by a Brammer V-rope drive off one of the axles of the van. The pumps deliver the water and chemical separately to a mixing chamber where they become a 3 to 1 solution which passes through the controls to the nozzles at a pressure of approximately 30 lb. per sq. in. The train runs at a speed of about 28 m.p.h., and a pressure relief valve is set to blow at 40 lb. per sq. in. should the speed increase too much. The whole of the equipment is mounted in the van.

There are eight nozzles through which the chemical is sprayed on to the line. Four of them are individually controlled, and the other four, a pair in each of two swing arms, have automatic cut-offs. The function of the cut-offs is to stop the spray when the arms are swung in by the operator. The control valves are linked so that when shut the mixture is by-passed to a weir tank, the weir of which is divided in the ratio of 3 to 1, so as to lead the mixture to the suction side of the two pumps in the correct proportion for their respective speeds.

The chemical concentrate is transferred from the tank wagons in which it is delivered to the train by a portable Delport petrol pump at the rate of approximately 5,000 gall. per hr. The pipe lines are so arranged that the middle tenders can be used for either water or concentrate.

A mechanical speedometer is provided to the van, and an electrical speed indicator driven from a generator in the van is fixed on the engine when working on the train. The train may be pushed or pulled, the guard being provided with a bell to the engine and vacuum

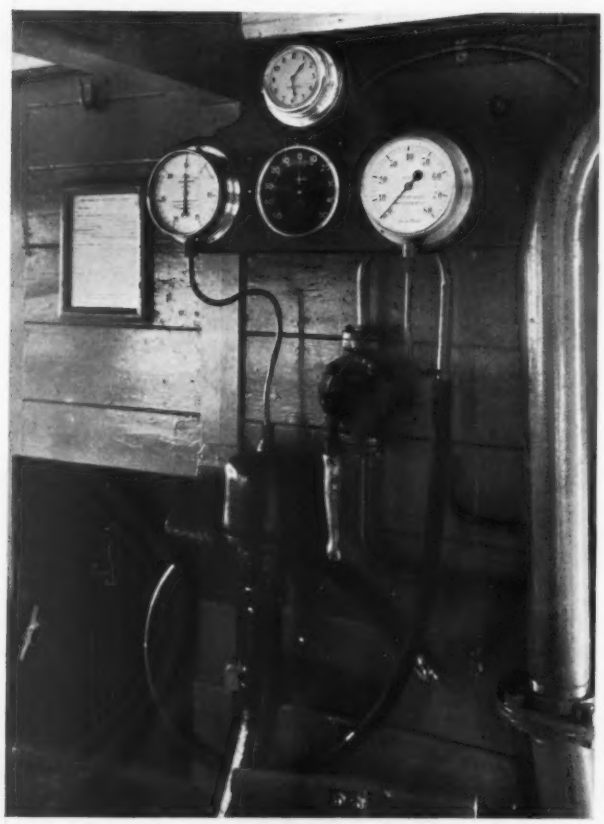
Interior views of equipment van of new weed-killing train, Southern Railway



Right: View looking towards rear of train, showing nozzle control valves in foreground, followed by mixing chamber, pumps, clutch, and weir tank near roof, with door to crew's quarters beyond

Left: General view looking towards front of train when propelling, showing instrument board on right, with whitewash tank below

General view of new weed-killing train, Southern Railway, showing equipment van in foreground with rail guards, nozzles and swing arms



Instrument board in equipment van, showing speedometer in centre, with pressure gauge on right

brake valves. Cooking for the train crew, lighting of the train and floodlighting are by Calor gas.

Although the train has been working only a short time, and is naturally experiencing minor teething troubles mainly in connection with refinements of adjusting, expectations have been fully realised. Night spraying has been eliminated and thanks to the speedometers the train can spray during the day in the electrified areas between trains and maintain a good schedule.

Loading the concentrated chemical takes only a short time, and the evening work is, therefore, reduced to a minimum so that the train is available longer for spraying. In the electrified areas the nozzles over the conductor rails are cut off, as also is one nozzle in the four-foot when passing through track circuits.

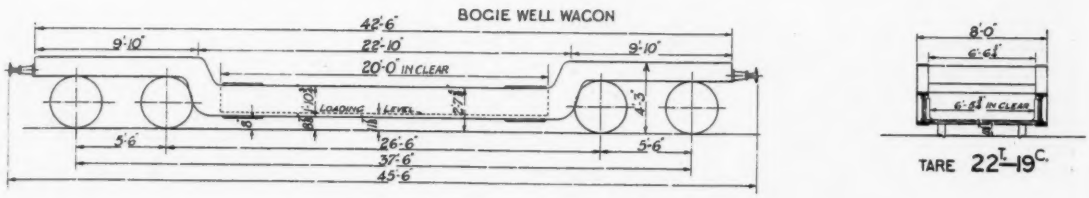
Considerable economy can be made by judicious use of nozzle cut-off, and to prevent misunderstanding where all the nozzles are cut off for short lengths during spraying, the fact is indicated on the track by a small line of whitewash dropped from the equipment van.

The spray van was equipped by Fraser & Chalmers Engineering Works under the supervision of the Chipman Chemical Co. Ltd. to the designs of the Southern Railway Company.

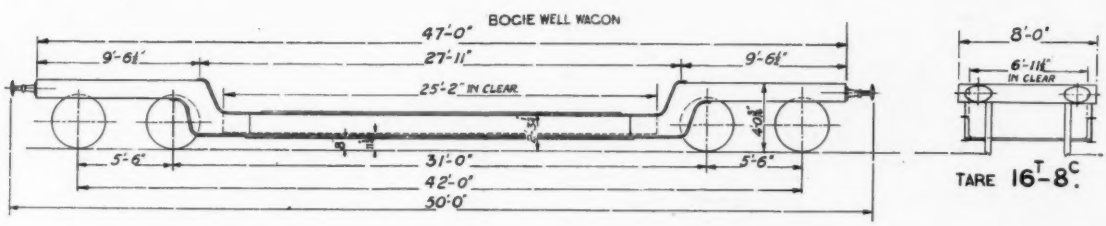
CORONATION SERVICE FROM LONDON TO SCARBOROUGH.—Beginning on Monday next, July 26, the L.N.E.R. will inaugurate a new express service between London and Scarborough in connection with its Coronation streamlined express train between London and Edinburgh. Business men and holidaymakers will thus be able to leave King's Cross at 4.0 p.m., and, by means of a fast connection from York, reach Scarborough at 7.50 p.m., thus completing the journey from King's Cross to Scarborough in 3 hr. 50 min. This service, which will be the fastest ever given between London and "The Queen of Watering Places" and will apply on Mondays to Fridays, inclusive.

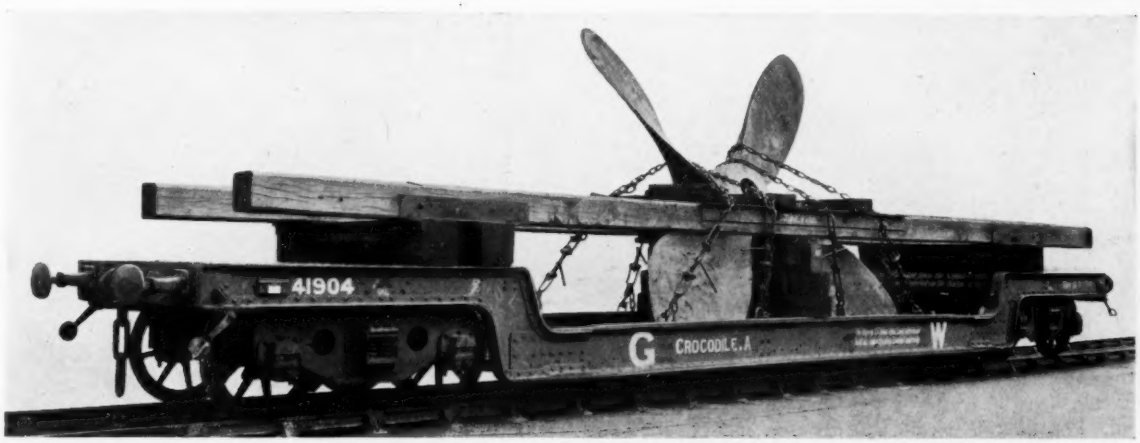
G.W.R. Vehicles for Exceptional Loads—VI

Two types of well wagon for outsize consignments of 25 and 45 tons



A 23-ton granite block on a well wagon for weights up to 45 tons





A ship's propeller 13 ft. 6 in. square, on a 25-ton capacity wagon specially adapted for such loads

CENTENARY OF EUSTON STATION

(See article on page 147)

Modern view of the Doric arch, Euston station

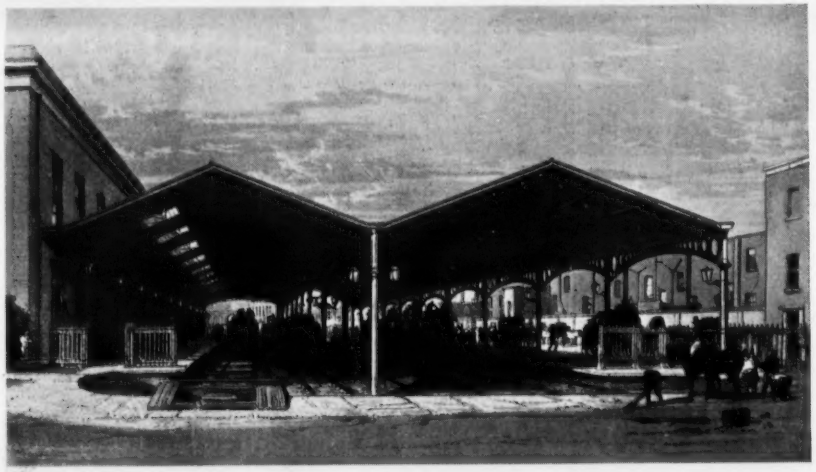
The 70-ft. turntable at Euston

Ackermann's "View taken from under the Hampstead road bridge looking towards the station at Euston Square," dated September 18, 1837

Early London & Birmingham Railway view entitled "Entrance to locomotive engine house, Camden Town"

Ackermann's "View taken from under the Hampstead road bridge looking towards the station at Euston Square," dated September 18, 1837

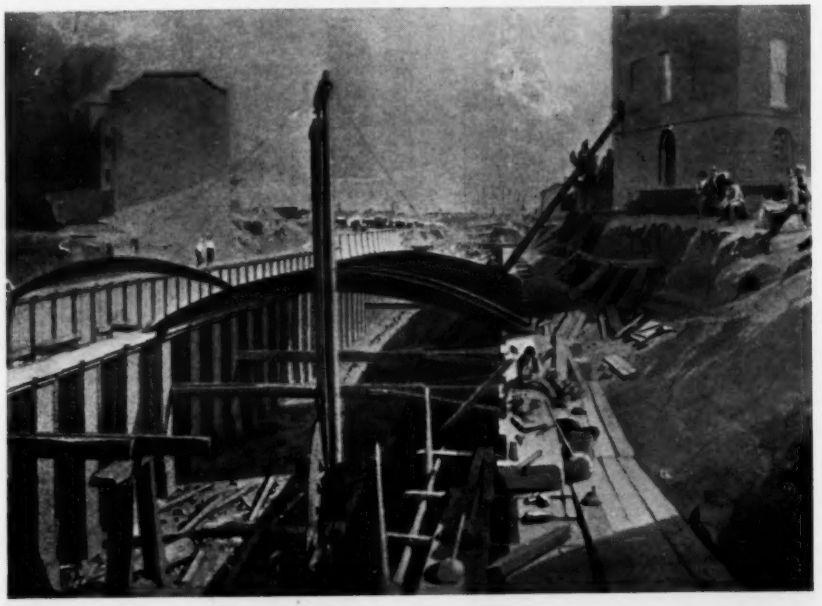
Early London & Birmingham Railway ... house, Camden Town"



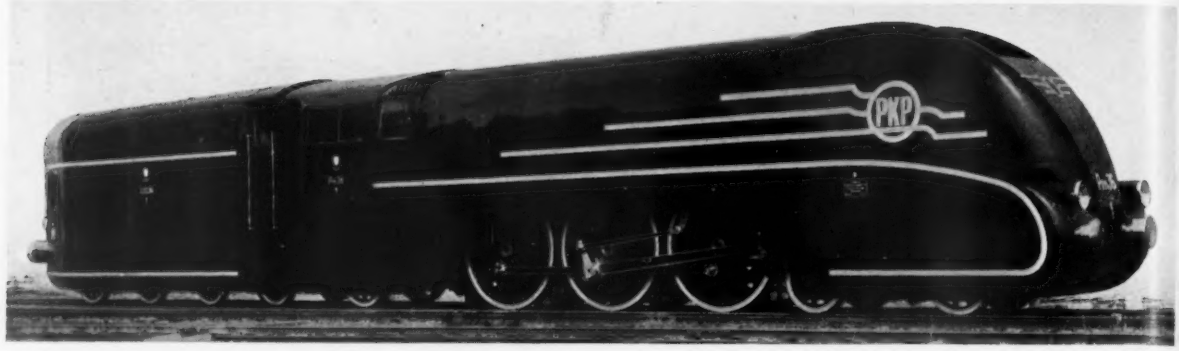
Original arrival and departure shed, Euston station, 1839. At this period horses were largely used for shunting carriages and operating turntables

View from an old engraving of "the excavation near Camden Town, with the stationary engine chimneys and locomotive engine house"

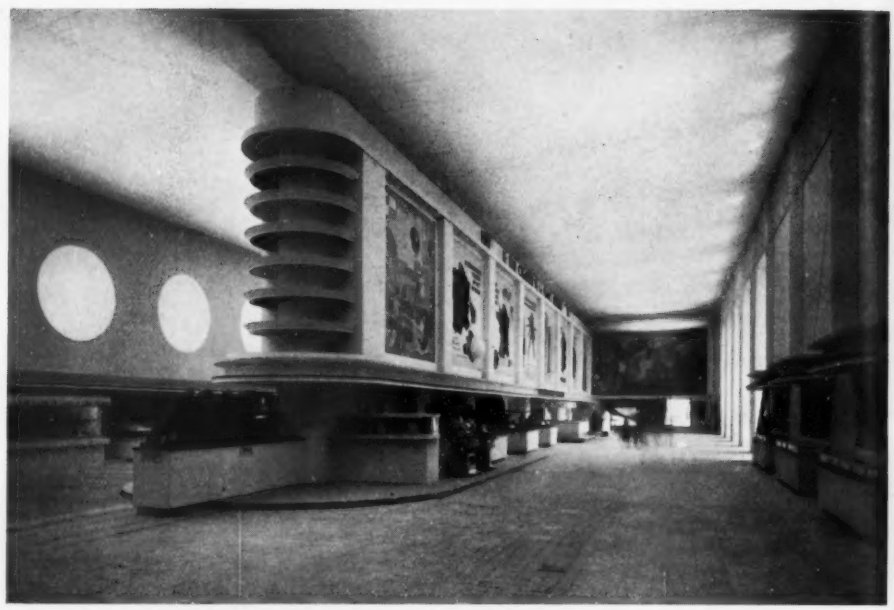
Original platforms (now the sites of Nos. 5 and 6) at Euston. The open third class carriages will be noticed



Scene during the construction of the London and Birmingham line between Euston and Camden



Above : New 4-6-2 streamlined express locomotive for the Polish State Railways, which is described in an article on page 148. This engine is on view at the Paris International Exhibition



Right : One of the main halls in the railway pavilion at the Paris International Exhibition. Mural diagrams show the growth of transport in France during the past century (see news article on page 161)

Left : A painting entitled "Travelling in 1860" by Thomas Musgrave Joy, which is in the exhibition of Victorian paintings at the Leicester Galleries. "Country Life," by whose courtesy we reproduce this, included the following comment by Mr. G. M. Young :—

"The foreshortening across the carriage is bungled, and some of the arms seem to belong to the wrong shoulders. But then, see how much the painter has got in. The ticket collector is bearded like a pard : perhaps he only wants to look like a Crimean veteran—perhaps he is one. The men are reading papers—"Punch," the "Daily Telegraph," the "Morning Post," "The Times" (two copies)—but not the women. Would it have been seemly for a lady in 1860 to buy a newspaper for the train? I am not sure. The charming young mother in the foreground is evidently very much a lady, and her book, I should guess, is Tennyson's "Idylls" in the edition of 1859. From the trees in the distance, I guess we are at a country junction."

(See editorial note on page 138)

RAILWAY NEWS SECTION

PERSONAL

It is with great regret that we record the death, on July 20, in Rome from heart failure of the Marchese Guglielmo Marconi, the famous pioneer of radiotelegraphy. We comment in an editorial note on page 137 on some aspects of his notable work in furthering means of communication.

Mr. W. F. Wegener, Assistant Chief Mechanical Engineer, Federated Malay States Railways, has been appointed Chief Mechanical Engineer of those railways.

Sir Francis L'Estrange Joseph, K.B.E., a Director of the L.M.S.R., is a member of a newly appointed Royal Commission on the Geographical Distribution of the Industrial Population of Great Britain.

Mr. E. Howell, Import Freight Agent, Chicago, Canadian National Railways, arrived at Plymouth on a visit to England on July 12.

It is with regret that we record the death on June 12, at Wargrave, Berkshire, of Mr. Henry Coulson Bond, President of the National Federation of Iron and Steel Manufacturers in 1920 and 1921.

We regret to record the death at Swansea, on July 5, of Mr. Abraham W. Hamer, Assistant District Goods and Passenger Manager, Swansea, L.M.S.R. Mr. Hamer held various positions in South and Central Wales with the former London & North Western Railway, and on the formation of the L.M.S.R. group he became Assistant Divisional Controller at Crewe. His appointment to Swansea occurred in 1930.

Mr. J. M. MacArthur, who as recorded in our issue of July 9, has been appointed General Manager of the Northern Alberta Railway, took over charge on July 2 from Mr. J. Callaghan, who has been General Manager since the line was taken over from the Alberta Government by the Canadian Pacific and Canadian National Railways jointly. Mr. MacArthur has had 35 years' service on the C.P.R., as Superintendent of various divisions for the past 20 of them, and resigned from the superintendency of the Vancouver Division to go to the N.A.R.

Sir George Beharrell, D.S.O., who, as recorded in THE RAILWAY GAZETTE of July 2, has succeeded the late Sir Eric Geddes as Chairman of Imperial Airways Limited, and the Dunlop Rubber Co. Ltd., was born in 1873, and educated at King James' School, Almondbury, Yorkshire, and at Leeds University. Entering the Secretary's Office

Sir George Beharrell, D.S.O.,
Chairman of Imperial Airways Limited, and the Dunlop Rubber Co. Ltd.

of the former North Eastern Railway in 1888, he was transferred in 1902 to the General Manager's Office and became Parliamentary Assistant to Sir George Gibb, whence three years later he went to the Goods Department for special work in connection with rates. In 1907 he became an Assistant to the Chief Goods Manager (Mr. Eric C. Geddes), and in 1913 was appointed Assistant Goods Manager. The association of Mr. Beharrell (as he then was) with Sir Eric Geddes continued in public work from 1915, when he joined him at the Ministry of Munitions. In 1916 he accompanied him to France to inquire into the transport problem, eventually becoming in 1917 Assistant Inspector-General of Transport in charge of statistics for all theatres of war. He was mentioned in despatches and awarded the D.S.O. On the appointment of Sir Eric Geddes as Controller of the Navy in May, 1917, Mr. Beharrell became Director of Statistics, responsible for the official statistics of personnel and material of the Navy, and for all statistics in connection with the submarine campaign. Sir George Beharrell, who was knighted in 1919, was one of the small staff assisting the then Minister-designate in the passage of the Ministry of Transport Bill through Parliament, and when the Ministry was formed in September, 1919, he was appointed Director-General of Finance and Statistics. After acting as Adviser to the Geddes Axe Committee in 1921 and 1922, he became Managing Director of the Dunlop Rubber Co. Ltd. in 1922, and was appointed a Director of Imperial Airways Limited on its formation. Sir George is a former President of the Federation of British Industries, the Society of Motor Manufacturers and Traders, and the Institution of the Rubber Industry. In July, 1935, he was Chairman of the Sixth International Congress for Scientific Management.

INDIAN RAILWAY STAFF CHANGES

Mr. L. F. Nolan, Deputy Chief Engineer, A.-B.R., proceeded on long leave on June 23, Mr. Q. Z. Husain acting in his place from that date.

Mr. F. G. Langdon has been appointed to officiate as Deputy Chief Engineer, Maintenance, G.I.P.R., as from May 17.

Col. H. L. Woodhouse, M.C., late R.E., at present on leave in England, has been granted an extension of leave for 1 month and 10 days as from August 2.

Lt.-Col. H. W. Wagstaff, M.C., R.E., Supervisor of Labour, Railway Board, has been granted seven months' leave, as from May 10.

Mr. W. H. H. Young, Chief Commercial Manager, E.I.R., has been appointed to officiate as Chief Operating Superintendent of that system as from April 28.

Mr. S. H. Sharp, Deputy Chief Mechanical Engineer, (C. & W.) G.I.P.R., has been granted two years' combined leave preparatory to retirement, as from May 7.

Mr. G. C. Laughton, Senior Government Inspector of Railways, has been granted leave for 6¾ months, as from May 14.

Mr. A. B. Turner, Deputy Chief Mechanical Engineer (C. & W.), Running, E.I.R., has been granted four months' leave as from May 14.

Mr. H. J. Allinson, Officiating Deputy Chief Mechanical Engineer, Electrical, E.B.R., has been granted seven months' leave as from June 6.

Mr. L. C. Glenister, who, as announced in THE RAILWAY GAZETTE of July 2, has been appointed to succeed the late Mr. R. Brown as Assistant Accountant, L.N.E.R., received his early training in accountancy in the Borough Treasurer's Department at Hastings from 1903 to 1911, but in March of the latter year he joined the former Great Northern Railway, and was posted to the joint lines section at King's Cross. A year later he was transferred to the bookkeeping section, where he was employed until, in November, 1914, he joined the Queen's Westminster Rifles (16th London Regiment) with which he served until 1919. In April of that year Mr. Glenister returned to the bookkeeping section at King's Cross, where he remained until the grouping in 1923, when he was transferred to the Chief Bookkeeper's Office of the L.N.E.R. In 1928 he was appointed Expenditure Assistant to the Chief Bookkeeper, and on January 1, 1935, was further promoted to be Locomotive Accountant, North Eastern Area, at Darlington, the position he has now relinquished to return to King's Cross as Assistant Accountant of the system.

Mr. L. C. Glenister,
Appointed Assistant Accountant, L.N.E.R.

Mr. C. B. Foster, whose retirement on July 1 from the position of Passenger Traffic Manager, Canadian Pacific Railway, after 46 years' service with the company, was recorded in our issue of July 2, was the recipient of a number of valuable gifts presented to him by Mr. George Stephen, Traffic Vice-President, on behalf of members of the railway and steamship passenger traffic organisations.

Mr. James Elliott, B.A., B.A.I., M.Inst.C.E., whose appointment as District Engineer, Abergavenny, L.M.S.R., was recorded in our issue of June 11, was born in 1897 and educated at Trinity College, Dublin. Beginning his railway career in 1922 with the L.N.W.R., as a pupil of Mr. E. H. Townshend, then District Engineer, Walsall, and later Divisional Engineer, Lancaster, L.M.S.R., Mr. Elliott entered the District Engineer's Office at Fleetwood in February, 1925, where he was engaged in general and permanent way works, bridge, and dock works. From August, 1928, to October, 1929, he was Divisional Hallade Assistant, Manchester, and was then appointed Resident Engineer, New Works. Mr. Elliott was engaged on new works until November, 1930, when he was appointed Assistant to the District Engineer, Barrow-in-Furness. In October, 1933, Mr. Elliott became Chief Assistant to Mr. S. O. Cotton, then Divisional Engineer, Hunts Bank, Manchester. From April to September, 1935, he acted as District Engineer, Manchester Exchange, and was then appointed Assistant to the District Engineer, Liverpool, which position he held until his present appointment.

Mr. James Elliott,
Appointed District Engineer, Abergavenny, L.M.S.R.

We regret to record the recent death of Dr.-Ing. Walter Reichel, one of the leading railway electrical engineers in the world. He was the inventor of the bow collector, and directed the celebrated high-speed trials with three-phase vehicles at Marienfelde early in this century. He was prominently associated with the Berlin Underground when it began, and he took a leading part in the technical side of the various Reichsbahn electrifications and the conversion of the Riksgräus railway in Lapland. An article entitled "High Speed Electric Railway Traction" from the pen of Dr. Reichel was published in our *Electric Railway Traction Supplement* for May 3, 1935.

We regret to record the recent death of Mr. R. A. G. Hannington, Manager of Swindon Locomotive Works, Great Western Railway, since 1922. Mr. Hannington served with that railway throughout his career, joining the company as a pupil at Swindon on October 12, 1903. In 1906 he went into the drawing office, and was appointed Assistant to the Divisional Locomotive Superintendent, Swindon Division, in 1909. Mr. Hannington was transferred to the London Division as Assistant Divisional Locomotive Superintendent in 1916, and in 1919 was appointed Locomotive Superintendent, Worcester Division. From July, 1922, until his appointment as Works Manager, Swindon, in September of the same year, he was Manager of the Swindon Carriage and Wagon Works.

The late Mr. R. A. G. Hannington.
Manager, Swindon Locomotive Works, G.W.R., 1922-37

We regret to record the death in Buenos Aires on May 28, of Mr. Christopher F. Sheil, Stores Superintendent, Cordoba Central Railway, who was 62 years of age. He had been in the employment of the railway for over 31 years, and was preparing to retire on pension. By energy and ability he had worked his way up through different departments of the railway, and after occupying the position of Purchasing Agent for the company, was appointed Stores Superintendent in August, 1931.

Railways at the Paris International Exhibition, 1937

(From our Paris correspondent)

Railways are given a prominent place in the Paris International Exhibition, 1937. The exhibits comprise a fine collection of some of the best types of the rolling stock of the leading Continental countries and are of great interest to the general public, as well as to the railway engineer. They are grouped in the Palais des Chemins de Fer (Railway Palace), covering an area of about 18,000 sq. yd. The site is part of the Invalides station, architecturally transformed in such a skilful way that the visitor would never guess he is in a station, except for the occasional muffled sound of an electric train in motion nearby. The palace comprises two main halls, one on the ground floor ornamented with brightly coloured designs and the other in the basement at the rail level, to which two grand staircases give access.

The keynote of the railway show is modern progress in the construction of rolling stock as illustrated in typical examples contributed by France, Germany, Belgium, Denmark, Italy, Poland, Roumania, Sweden, and Switzerland. There is little reference to the historical side of the railways, as the organisers considered that this has been fully dealt with in recent centenary celebrations. Instead, special attention is given to current developments in railway improvements. The use of stainless steels, and light alloys, coaches built in tubular form to give lightness combined with added strength, applications of electrical welding and streamlined construction are all illustrated in existing types.

Progress in Recent Years

Increased power tending to raise the maximum speed to 200 km.p.h. (125 m.p.h.) and devices to assure greater security and comfort for passengers are exemplified in the locomotives, railcars and coaches on view. Petrol motors and diesel engines with electric, hydraulic or entirely mechanical transmission for powers up to 500 b.h.p. indicate the progress made by the railways in recent years with the aid of the automobile industry.

In some special French exhibits on the ground floor near the main entrance, there are shown examples of the social welfare work of the railway companies in the form of model dwellings for railwaymen, the operation of old-age insurance and sickness funds, sports and holiday centres, precautions against accidents and the psychotechnical tests of drivers and signalmen. Six large luminous panels stress the important part played by the railways in the evolution and transformation of economic conditions in France.

Descending the grand staircase, the visitor arrives in the spacious basement hall, where the rolling stock is presented. Attracting immediate attention by its brilliant illumination is the section of the Nord Baltic type locomotive, illustrated in THE RAILWAY GAZETTE of March 19, and showing the passage of the steam from the boiler through the superheater to the high and low pressure cylinders by means of vivid red discharges in electric tubular lamps, the colour changing to blue for the superheated steam. The path of the combustion gases is shown by yellow colouring.

Before inspecting the rolling stock, the visitor may note a large map of Switzerland in relief, indicating the electrified and steam railways of that country, the motor-car roads and lake steamboat services. Other models, not yet in place at the time of writing, are to show the operation of the Dunkerque-Dover train ferry, while the Roumanian State Railways present a boiler for firing by coal and oil. The Algerian Railways show models of their stations at Philippeville and Souk-Ahras.

A scenic tour of France may be made by the spectator seated in a stationary carriage while dioramic views flash past at high speed. The views cover a surface of nearly 1,500 sq. yd., and are more than 200 yd. long. They are shown in a special room. This illusion of actual travel presents scenery of Brittany, the Pyrenees, the Basque Coast, the Riviera, Alps, Jura, Vosges and Alsace-Lorraine. The International Sleeping Car Company elsewhere presents a relief map illustrating journeys in Europe and the Near East.

Rolling Stock Exhibits

French rolling stock exhibits include three typical railcars, a Bugatti, Renault, and a Standard. Specially interesting is one of the new lightweight coaches of the State Railways, described and illustrated in THE RAILWAY GAZETTE of May 21. The construction may be studied in detail, as parts of the interior are left uncovered for close inspection by the visitor. An Etat high-speed 2-Do-2 electric locomotive of 4,000 h.p. is shown in detail, with parts left bare for inspection. Two refrigerator cars with ammonia as the refrigerant are on view. One of these is intended for the Anglo-French traffic, and is built to the English loading gauge. Other exhibits comprise a wagon carrying milk tanks, tractors for luggage cars on station platforms and for shunting, Alsthom automatic couplers for railways, Michelin, Renault and de Dietrich railcar bogies, as well as one of the fast electric set trains used for the Etat Paris suburban service.

The International Sleeping Car Company (Compagnie Internationale des Wagons-Lits) shows some of its up-to-date vehicles combining the latest devices for assuring the comfort of passengers in all classes, all forming a tempting inducement to travel. The Paris Metropolitan is represented by a stand surrounded by a model of its underground lines with sections of stations, showing lifts, escalators, automatic gates, signals and substations. Inside the stand are other models. Particularly interesting is one of the Place de la République with five lines running in separate tunnels, two of them one above the other.

German and Italian Displays

Germany's rolling stock is well represented, and comprises a wide variety of exhibits. Outstanding examples are a 15 kV. single-phase electric locomotive and a diesel locomotive with hydraulic transmission, as well as a series of four diesel engines ranging from 180 to 600 b.h.p. There is a ballast wagon with automatic discharge, a loco-tractor for shunting, and a signal cabin panel. The German railway coaches are models of comfort; the upholstering has evidently been studied in the closest detail to give reposeful seating. Ingenious individual reading lamps and other devices add to the passenger's comfort.

Italy has an outstanding feature in the form of a triple-car high-speed electric train of the type described in our Supplement this week. It worthily represents Italian railway progress. Italy also presents a single diesel railcar likewise capable of attaining high speeds.

Poland's Tourist Train

Poland has a novel exhibit in the form of a streamlined train, designed to meet the requirements of visitors to winter sports resorts or to take parties of travellers through various European countries. It is equipped with the conveniences and luxuries of a first class hotel. There are compartments for douches, complete bathrooms and hairdressing saloons, as well as first, second, and third class sleeping compartments. Two adjoining compartments can be combined to form a sitting-room in the daytime. Skis are stowed away in a special cabin. One coach with special flooring serves as a dancing hall with buffet bar, or as a cinema. This luxurious train is hauled by a streamlined Pacific locomotive, intended to serve as a model for a series of high-speed locomotives in Poland. The driver's cab is entirely enclosed and forms a complete ensemble with the tender.

Belgium shows three of the new all-steel coaches illustrating the comfortable accommodation offered on the National Railways, while the Belgian Vicinaux (metre gauge) lines exhibit two railcars, one electric and the other diesel-engined.

Land of the Midnight Sun

Sweden also displays rolling stock adapted to the requirements of tourists travelling to the mountains and lakes, or to the land of the midnight sun. First, second and third class sleeping berths are models of comfort and

cheapness. Extremely low rates are in force for long distances. One of the numerous small petrol railbuses for winter sports service, is shown, the particular example being equipped with skis carried outside, while the roof is left free for luggage.

Denmark has on view one of her renowned triple Lyntog diesel trains, which for the last two years have operated fast services between Copenhagen and all the principal towns of the kingdom. These trains are driven by two sets of diesel engines with electric transmission.

Containers, hitherto little used in France, are given a special place. Large and small types, as used by different European countries, are shown in a special open court. Some of the new French models are of particular interest. Beyond the court is a cinema hall intended for the showing of technical films illustrative of all phases of railway engineering.

A New Rubber Product

A new rubber composition which in liquid form can be used as a non-corroding paint, and as a solid provides an acid-resistant flooring and lining medium, is about to be produced in this country by Rubtex Limited, Printing House Lane, Hayes, Middlesex. The firm is already established in France, where Rubtex, mixed with sand, has been used to form the floor of the battery room at the Gare du Nord, Paris.

Railways in this country are already investigating applications of Rubtex. The material is being tested as an alternative to lead for lining carriage battery boxes, twelve of which have been so treated experimentally for the L.M.S.R. The elasticity of the solid makes it very suitable as a jointing medium for pipes, as the joint remains completely watertight if movement of the ground takes place. On the Southern Railway, a length of steel rod coated with Rubtex paint was immersed in acid to test the resistance to corrosion claimed for the material. Although the rod was completely eaten away, the sheath of Rubtex paint was unaffected in any way and remained intact.

Rubtex chlorinated rubber and rubber paints are supplied in all colours, and suggest themselves as a permanent and washable medium for station decorative schemes, which all too often succumb rapidly to the effects of smoke. The same qualities recommend the paints or the non-decorative Rubtex liquid as watertight preservatives for engine sheds, bridges, and other structures exposed to smoke and steam. Special non-reflecting grades of paint in white or black matt are available for signal painting.

Solid Rubtex has been used as a binder in road making, and has proved itself capable of withstanding exposure to high temperatures without deterioration of its adhesive properties.

PARLIAMENTARY NOTES

Underground Extension

References to the "Underground" extension were made in the course of a debate on the third reading of the London Passenger Transport Board Bill in the House of Lords on July 14.

Lord Ashfield said that amendments which had been put down by Lord Brocket would, if given effect to, seriously affect the transport facilities in a very considerable area of London. He reminded the House that a committee composed of representatives of the London Passenger Transport Board and of each of the four main-line railways was set up under the Act of 1933, and after a long and exhaustive examination they prepared a programme of improvements involving an expenditure of some £40,000,000. The programme provided for extensions to the underground system in the form of physical junctions with some of the suburban lines of the main-line railways, for the electrification of some of the branch lines of the main-line railways, for widening where necessary the suburban lines, and improvements for some of the underground stations in the centre of London. The scheme was the subject of an agreement between the London Passenger Transport Board, the L.N.E.R., the G.W.R., and the Treasury. The part of the programme which would be affected by the amendments included the extension of the Underground line which now terminated at Highgate to a point where it formed a physical junction with one of the suburban lines of the L.N.E.R., and an extension of the Underground which now terminated at Finsbury Park also to form a junction with the suburban lines of the L.N.E.R. It provided also for the electrification of the Edgware, the High Barnet, and the Alexandra Palace lines, and for the widening of the Edgware line, which was now a single track line and where a service of only one steam train an hour was being worked at present. The purpose was to run a through service of electric trains from stations on the suburban lines to stations in the West End and also in the City of London. The scheme also provided for extending the Bakerloo Line from Baker Street to Finchley, where it formed a junction with the Metropolitan Railway. By that arrangement it would be possible to operate the Bakerloo trains on the Metropolitan Railway Stanmore branch line, and that would afford a through service of trains from that line to the West End and the City. The scheme also provided for the purchase of a considerable amount of new rolling stock on the Edgware-Morden line. In the new rolling stock the electrical equipment would be placed beneath the floor of the car and more space would be made available for passengers. There would be more rapid acceleration and deceleration; and there would be better service on this line, where it must be admitted there was a fair amount of congestion. With the completion of the scheme it was anticipated that some of the passengers who now used the Edgware-Morden Line would transfer their patronage to the Stanmore line. In addition to the 40 per cent. advantage gained by improvement of rolling stock there would be another through line brought into service under the programme. With regard to the extension line northwards to Aldenham it was necessary to acquire a site for a depot. He could assure the House that there was no other site adjacent to the railway which would meet the requirements of the board. The depot was to be of a new type, called a double-ended depot.

Fares on the Morden and Edgware line were on a lower scale than those on the Stanmore branch, because the former was originally under the Underground Company and the Stanmore line under the Metropolitan. When the full scheme of improvements was brought into effect, it would be necessary to make some adjustment between the fares on the two lines in order that traffic might be more fluid, and flow more freely on the different lines.

The Bill was read a third time.

On the motion that the Bill do now pass, Lord Brocket moved an amendment to Clause 14 (description of new works) to provide that the railway extension to Aldenham should be left out. The Bill proposed an extra length of railway and two stations. No objection was taken to the station nearer London. The proposed alternative site to the second station, which had been surveyed, was a little further from the first station, and the railway would bear to the right and go near the existing Midland Railway. Unlike the site proposed in the Bill, it was neither in the orbit of the Green Belt nor on the side of a by-pass road. The surveyor's report stated that it would effect a considerable saving in the initial cost of construction. The necessary depot could also be put there at considerably less cost.

Lord Cozens-Hardy, who was chairman of the Select Committee of the House of Lords which dealt with the Bill, said that however much they might all regret the continual encroachments of London on the country, they could not ignore the traffic necessities of the population. The evidence before the committee certainly satisfied him that increased facilities for travel between London and the country on the North-west were very necessary. He asked the House to reject the amendment.

In the course of further discussion, the Earl of Onslow, Chairman of Committees, asked the House to think very carefully before they took the un-

precedented step of revising the considered opinion of a committee which had gone into the matter during several days and had had the advantage of counsel, witnesses and affidavits, and had seen the maps and plans.

The Earl of Erne, Lord-in-Waiting, said that the view of the Government was that the necessity for the proposed extension and depot had been established, and that to refuse the necessary powers would delay and might even jeopardise the whole scheme of urgently needed improvements. The Government hoped that the House would uphold the decision of the Select Committee and allow the Bill to pass without amendment.

Lord Ashfield said that the alternative site suggested by Lord Brocket had been surveyed by the board's engineers, and it was wholly inadequate to meet their requirements.

The amendment was rejected by 53 votes to 24, and the motion that the Bill do now pass was agreed to. The Royal Assent was given on July 20.

QUESTIONS IN PARLIAMENT

Bakerloo Railway

Sir Reginald Blair (Middlesex, Hendon—U.) on July 8 asked the Minister of Transport, at what approximate date would the works now in progress joining the Bakerloo tube with the Stanmore Metropolitan Line be completed.

Dr. Leslie Burgin (Minister of Transport): I am informed by the London Passenger Transport Board that it is hoped that the Bakerloo Line service to Stanmore will be put into operation in the spring of 1939.

Safety Requirements

Mr. David Adams (Durham, Consett—Lab.) on July 8 asked the Minister of Transport, whether, in view of the official finding that the cause of the derailment of an L.N.E.R. express train at Langrick, on March 8, was decayed track sleepers, and that serious misjudgment of the remaining strength of the permanent way had been made, he could give an assurance that the additional strain of fast traffic was now fully met as regards track equipment and other safety requirements upon the railways of the Kingdom.

Dr. Burgin: The responsibility for operation and for maintenance of their lines rests solely with the railway companies, and I am satisfied that they are fully alive to all the safety requirements of fast traffic.

Overcrowding on Morden Tube

Dr. L. Burgin (Minister of Transport), speaking on July 9 on the Ministry of Transport Vote, reviewed the work of the Department. Dealing with the overcrowding of suburban trains, particularly on the Morden Line, he said that Parliament had deliberately placed the responsibility for suburban trains upon the London Passenger Transport Board, and not upon the Minister. The Minister's power was confined to making certain recommendations, and did not include the questions of facilities or fares. The number of trains that could be run on a tube railway was governed by three or four elementary considerations—the speed at which a train could be run, the efficacy of its brakes and the straightness of the tunnels. Broadly speaking they came to a time at which they were running their trains as fast as they could, braking them as sharply as they could, and the tunnels had been straightened to such an extent that they would find that they had very nearly reached capacity. He had suggested that employers should consider the propriety of "staggering" the arrival, the luncheon interval, and the departure of some of their staffs. Although that might not be an immediate problem, it was one which in any large aggregation of population required attention. The plain fact was that so long as everybody wanted to travel at the same time serious overcrowding was almost inevitable, unless additional tube lines were made to deal with the peak loads, a proposition which was financially impracticable. The increase in traffic overcrowding on the Morden line was to be regretted. The increase of traffic in ten years had been remarkable. All kinds of additional signalling had been introduced, and the line was now carrying the maximum number of trains, 40 an hour at peak times, and carrying 1,500,000 passengers during the peak hours. In those circumstances the only possible method of increasing traffic capacity was by reconstructing the trains, and that was being done. With higher acceleration, improved braking, and additional capacity, it was hoped to work a service exceeding 40 trains an hour, but what the maximum number might be must depend on practical engineering experience. Additional men had recently been appointed to the platforms on that particular line. A further extension of platforms and trains was a matter which was likely to create difficulty amounting to impracticability wherever tunnelling difficulties were involved. The overcrowding on that particular railway was a matter which was being very closely looked into. He had particulars of the London Passenger Transport Board's proposals for lessening overcrowding on their tubes, dealing with such lines as the Edgware-Golders Green and other lines. The main proposals consisted of extending the Highgate tube to the L.N.E.R., doubling the L.N.E.R. line to Edgware, linking the Bakerloo Line at Finchley Road with the old Metropolitan Line to Stanmore, realigning the track between Finchley Road and Harrow, and the provision of new and improved rolling stock. The aim and object of the whole of the administration of his department was to endeavour to give to the travelling public the facilities to which they were reasonably entitled, and to ask the concurrence of the travelling public in observing reasonable regulations for maintaining the safety of those traffic routes. He was anxious as far as possible not to have to resort to a series of restrictive regulations. He believed that much could be done by way of appeal and encouragement.

Electrification of Suburban Services

Mr. H. Parker (Essex, Romford—Lab.) on July 15 asked the Minister of Transport whether the scheme for electrification and improvement of the suburban services out of Liverpool Street were to be proceeded with or postponed; and, if the latter, for what reason and for how long.

Dr. Leslie Burgin (Minister of Transport): I am informed that it is the intention of the Standing Joint Committee of the London Passenger Transport Board and the main-line railway companies to proceed with the schemes for the electrification and improvement of the suburban services out of Liverpool Street station as already announced.

Railway Companies and Blind Travellers

Sir George Jones (Stoke Newington—U.) on July 16 asked the Minister of Transport whether he was aware that the railway companies of Great Britain, parties to the clearing system, including the London Passenger Transport Board, were requesting various persons suffering from blindness or defective sight, as a condition to being allowed to travel on their railway lines, &c., to relieve and indemnify them against all liability in respect of personal injury, loss of or damage to property, detention or delay, by whomsoever caused or suffered, arising directly or indirectly from the blindness or defective sight of such persons; and whether his department would take any, and what, steps to protect such persons from this harsh treatment.

Dr. Leslie Burgin: As a result of enquiries which I have made into this matter, I am informed that the railway companies and the London Passenger Transport Board have recently decided to require an indemnity to be given by any blind person or person with defective sight proposing to travel unaccompanied, and that forms of indemnity and permit have been drawn up for issue through the Railway Clearing House. I am communicating with the Railway Clearing House on the subject, and will inform my hon. and learned friend of the result.

STAFF AND LABOUR MATTERS

Railway Staff National Tribunal Hearing of Union claims begins

On Tuesday last, July 20, the Railway Staff National Tribunal began at Montagu House, Whitehall, S.W.1, the hearing of the wage claims put forward by the three railway trade unions. The claims affect about 400,000 employees of the main-line railway companies, in salaried and conciliation grades. Sir Arthur Salter, K.C.B., D.C.L., M.P., is the Chairman of the tribunal, and with him are two other independent members, Mr. Maurice S. Gibb, C.B.E., J.P., and Mr. H. J. May, O.B.E., J.P. The tribunal is assisted by six assessors: Sir R. L. Wedgwood, C.B., C.M.G., Sir James Milne, K.C.V.O., C.S.I., and Mr. G. L. Darbyshire, nominated by the railway companies; and Messrs. W. T. Griffiths, J.P. (N.U.R.), W. J. Evans (A.S.L.E.F.), and F. C. Watkins, J.P., M.P. (Railway Clerks' Association). Messrs. John Marchbank (N.U.R.), W. J. R. Squance (A.S.L.E.F.), and W. Stott (R.C.A.) are presenting the cases of the unions and Mr. Kenelm Kerr, O.B.E., is appearing in reply for the four railway companies.

At the outset of the proceedings the Secretary to the tribunal read the terms of reference which had been agreed between the parties and which asked the tribunal to hear and decide the following claims:—

By the National Union of Railwaymen

(1) Cessation of the percentage deduction from earnings at present operating under Clause 10, Part I, of Railway Staff National Tribunal Finding No. 1, dated July 27, 1936.

(2) Complete restoration of the standard rates of payment in operation prior to National Wages Board Decision No. 119, dated March 5, 1931, in respect to overtime, night duty, and Sunday duty.

(3) That the minimum rate of wages payable to any adult shall be not less than 50s. a week.

By the Associated Society of Locomotive Engineers and Firemen

(1) Termination of the deduction of 1¼ per cent. from earnings at present operating under Clause 10, Part 1, of Railway Staff National Tribunal Decision No. 1 dated July 27, 1936.

(2) Restoration of the standard rates of payment in operation prior to National Wages Board Decision No. 119 of March 5, 1931, for night duty, night overtime, and Sunday duty.

(3) After 12 months' service two weeks' holidays—twelve weekdays—with full pay to be given annually.

(4) Cancellation of the provision for an extension of rosters, where economy will accrue up to nine hours a day.

(5) A guaranteed day for each time of signing on duty on Sundays.

By the Railway Clerks' Association

(1) Discontinuance of the balance of the deduction from earnings which the National Wages Board decided should take place as from March, 1931, and the Railway Staff National Tribunal reduced to 1¼ per cent. as from August, 1936.

(2) A special increase of £10 per annum for those who for three years have been on the maximum of their respective classes and for whom no promotion is available and, after a further three years, another increase of £10.

(3) Reduction to 36 a week of all hours of duty in excess of that number.

(4) In addition to the existing provisions of the national agreements, extra payment to be made for all duty between 6.0 p.m. and 6.0 a.m., the extra payment to be 25 per cent. above day rates for those who receive the "one night off in ten" and 50 per cent. for those to whom that night off does not apply.

(5) The equivalent of a day off duty for all who work on any Bank or public holiday other than Good Friday and Christmas Day in England and Wales and January 1 and 2 in Scotland.

Sir Arthur Salter referred to the special difficulties which arose in December last, partly because of the fact that the claims of the Associated Society of Locomotive Engineers and Firemen, then being heard, would have involved repercussions upon members of the other unions. Sir Arthur said "I should like to congratulate both the three unions concerned and the railway companies. They have been able to time and arrange the procedure at the early stages in such a way that all three unions come with their claims to this tribunal at the same time. I want to remark, incidentally, that except in regard to claims which, both in amount and in their character, are such as not to involve important repercussions upon members of other unions, that is an essential condition of a tribunal like this working satisfactorily. Happily, that condition is satisfied this time."

The N.U.R. Case

Mr. Marchbank, in opening the case on behalf of the National Union of Railwaymen, submitted a number of statistical statements ranging from financial to social questions. He said that the justification for deductions from earnings and variations in conditions which were accepted as a temporary expedient no longer existed. He argued that the general upward movement in railway traffics had continued and showed signs of improvement. In support he referred to evidence given by Sir William Wood and Sir Ralph Wedgwood to the Railway Rates Tribunal recently, and here Sir Arthur Salter intervened to say that before the Railway Staff National Tribunal had to take a decision on the staff claims now being heard he hoped the decision of the Rates Tribunal on the companies' proposal to increase charges would be published.

Mr. Marchbank forecast that the net revenue for 1937 would be nearly £40 million and claimed that the improvement should be shared by the staff who, he urged, had "invested their lives and their earning power in the railway industry," and who had made "generous sacrifices" in the matter of wage concessions during the past few years. Continuing his argument on the financial position of the railway companies, he submitted that the "Rating relief in respect of the years 1931 to 1936 placed the companies in a stronger position currently and justified a claim by the employees for consideration in respect to wages and conditions." In this connection he gave figures showing the total rating relief for 1931 to 1936 as £9,457,800, which sum was allocated to the companies' reserves. The reserves of the four companies for 1936 totalled £65,629,755 compared with £58,660,351, but it was pointed out that in 1929 the comparable figure was higher, being £71,866,312.

The 50s. Minimum

Mr. Marchbank's most important claim was that the minimum rate of wages payable to any adult should not be less than 50s. a week. He urged that the minimum adult rate at present in operation was not sufficient adequately to provide the necessaries of life "and to cover the value of the services rendered." He made the point, in answer to a question, that the claim covered women as well as men, adding that the union believed in equal pay for equal work—with no sex distinction. He explained that by the term "adult" he meant "at age twenty."

Mr. Marchbank said there were a hundred thousand staff covered by the Machinery of Negotiation who were in receipt of basic rates of pay below 50s. a week, and he then submitted a series of weekly household budgets which, he said, had been compiled by members of the union. In addition to the rate of pay of the man concerned the documents gave information as to the number of persons in the family, as well as an itemised record of the weekly expenditure of the household. Mr. Marchbank spent some time in reading these budgets and he then proceeded to refer to Mr. B. Seebohm Rowntree's book "The Human Needs of Labour." In particular he drew attention to the dietary given by Mr. Rowntree, also to the quantities of food used and the cost of the dietary, in respect of a family consisting of a man wife and three children. He claimed that this dietary was more than the "meagre earnings" of railwaymen could afford and that many railwaymen were merely "existing."

He then gave an analysis of the budgets submitted by the National Union of Railwaymen compared with the budget given by Mr. Rowntree, which sets out the following figures: rent, 9s. 6d.; clothing, 8s.; fuel and light, 4s. 4d. household sundries, 1s. 8d.; personal sundries, 9s.; food, 20s. 6d. Total 53s. a week. Mr. Marchbank then devoted some of his speech to arguments based upon the cost of living which he claimed was increasing and went on to argue that the minimum rate of 50s. a week for

adults was "necessary to cover the value of services rendered." Citing examples in the permanent way grades, he claimed that large numbers of employees could not hope for promotion to posts entitling them to higher rates of pay. All grades, he said, were necessary to provide an efficient railway service and although railwaymen were proud of being railwaymen they would be happier if their remuneration was consistent with the service which they render. In conclusion Mr. Marchbank urged that the union's claims had been established.

A.S.L.E.F. Case

Mr. Squance began his submissions to the tribunal shortly before four o'clock on Tuesday afternoon. He urged that, with the improved financial position of the companies, the termination of the percentage deduction and the restoration of the standard rates of payment for night duty, night overtime, and Sunday duty was long overdue." Mr. Squance said that the speeding up in railway practice, in recent years, had rendered the duties of footplatemen very trying and difficult. He referred to the fact that all drivers and firemen were required to undergo medical, optical, and technical examinations periodically and then went on to speak of the hardships suffered by men in the matter of retardation of promotion and by redundancy. He gave instances of money losses suffered by enginemen during the worst years of the depression.

In reply to a question put by the Chairman he said he would agree, however, that with improving traffics practically all men who had suffered through redundancy, by being put back to lower grades as the alternative to dismissal, had now been restored to their former grades. Mr. Squance suggested that the prosperity of the railway industry was evidenced by the considerable expenditure of the railway companies on new and larger locomotives, improved stations, extensive signalling installations, and so forth.

Wednesday's Proceedings

Mr. Squance continued his case for the A.S.L.E.F. on Wednesday morning, July 21. He submitted a series of figures of expenditure and net revenue, &c., and argued that the companies' financial position had improved during the last few years. He stressed the sacrifices made by the staff and suggested that while the companies had been generous to the stockholders by withdrawing substantial sums from reserves in order to pay dividends, they had not been equally generous to the staff. He thought the staff should share the benefit accruing to the companies in respect of rating relief recoveries and the better industrial position. He also gave details of the increase this year in published railway traffic receipts.

In pressing the society's claim for increased holidays with pay for locomotivemen, he referred to the schemes of modernisation applied to the main and subsidiary locomotive sheds of the L.M.S.R. which were recently described in THE RAILWAY GAZETTE. The economies and changes thus effected had, he argued, increased the mental strain of enginemen. He went on to give an example of the different systems of signalling which had to be observed by engine drivers proceeding between Brent (L.M.S.R.) and Hither Green (Southern), and Mr. Squance then gave instances of what he described as "typical instances of speeding up of train working" and went on to refer to the new high-speed trains between London and Scotland which the L.M.S.R. and L.N.E.R. Companies introduced this month.

Mr. Squance submitted that "modern conditions of employment involving continuous duty for weeks and months with no opportunity for relaxation of any kind, compelled the expenditure of mental and physical energy which could be renewed only by extended holidays, ensuring sufficient rest and recuperation, to fit men for the ensuing twelve months' duty." He further argued that Sunday duty for locomotivemen was increasing in volume every year and that "this entailed greater sacrifices by the giving up of their own social amenities for the benefit of others."

The society was seeking the abolition of what was known as the "nine-hour roster" and, in dealing with this item, Mr. Squance said the eight-hour working day was conceded in December, 1918, and applied from February, 1919—eighteen years ago—and argued that in this period sufficient experience had been gained to ensure that all workings should conform to an eight-hour roster. There was, he said, keen opposition to the working of "preventable overtime" and its abolition was demanded by many sections of the society's membership. The fifth claim of the society was for a guaranteed day for each time of signing on duty on Sundays. Mr. Squance referred to the increase in Sunday services on all railways and it was urged that "justice and equity could only prevail" by granting the society's claim.

In the closing phrases of his speech Mr. Squance said that his members objected to turns of duty which involved lodging away from home and he urged that efforts should be made to abolish all such turns, or at any rate to reduce them to a minimum. He spoke, too, of the recent rise in commodity prices and in the cost of living, and concluded by speaking of the intensity of the employment of footplatemen which adversely affected their health. He urged that to counteract the strain and stress of their duties and their irregular hours and meals, further opportunities of rest, relaxation, and recuperation should be granted to locomotivemen. He asked the tribunal to grant the society's claims.

R.C.A. Case

Mr. Stott, opening the Railway Clerks' Association case, said the association considers that the passing of another twelve months, and the increase in the railway companies' receipts during that period, justify the complete termination of the balance of deductions that had been admitted to be only "temporary." Mr. Stott reviewed, briefly, the companies financial position and said his association was disturbed by reason of the fact that the increase in traffic receipts had been accompanied by an increase in expenditure, which increase he thought was somewhat disproportionate.

Dealing with the claim for special increases in pay for those for whom promotion was not available, Mr. Stott said there were thousands of railway salaried staff who had had no promotion for years. Figures compiled by his association showed that out of a total staff of 55,036 male clerks there were 12,798 who were "stagnating." In other words, these clerks had had no increase in their present pay for three or more years. Mr. Stott admitted that his data were, inevitably, incomplete and did not fully represent the position, but he submitted that it did, at least, give the tribunal some measure of the position. It was contended that since 1921 there has been a considerable reduction in the number of positions above Class 5, and consequently a reduction in the opportunities for promotion, and although there had also been an appreciable reduction in the number in the lowest class, the rate of promotion had slowed down and the average age at which the staff was now promoted from class to class was higher than in 1921.

It was said that the reduction in staff had not been entirely occasioned and justified by the falling off in traffic, but had also been made possible by amalgamations and poolings, by reorganisation, and by mechanisation, and as the companies had abolished and de-graded so many positions and thus diminished the prospects of promotion or deferred the possibilities of advancement that were related to the standard conditions in the national agreements, the Association considered the staff was entitled to some compensation.

The present classification was based on the system of classification that was introduced by the L.N.W.R. in January, 1912, and that company instituted in October, 1913, an arrangement under which an extra advance of £10 per annum was given to the staff who had been on the maximum of Class 5 for five years or more, and for whom there had been no opportunity of transfer to a higher class. A similar arrangement had been in operation in the Railway Clearing House for many years. In June, 1924, the Chairman of the Irish Railways Wages Board decided that after three years on the maximum of Class 5, a stationmaster, clerk, or supervisor should if not previously promoted,

automatically proceed to the minimum of Class 4.

Moreover, Mr. Stott contended that on the G.W.R. and L.N.E.R. special increases, over and above the agreements, had in certain circumstances been granted to stationmasters and clerks whose classification those companies could not see their way to improve.

Mr. Stott had not concluded his address to the tribunal when Wednesday's proceedings ended.

N.U.R. President

At the annual meeting of the National Union of Railwaymen last week Mr. W. T. Griffiths, J.P., was re-elected President. Mr. Griffiths was a former Mayor of Newport (Mon.) and is sitting as an assessor, on behalf of the union, during the present proceedings of the Railway Staff National Tribunal.

La Guaira & Caracas Railway.—Mr. J. A. Goudge, presiding on July 7 at the annual meeting, said that the company had taken nearly £11,000 more in the year 1936, which, unfortunately, had been absorbed by expenses, but it might be said that generally things were improving in Venezuela and that every month showed a continuance of that improvement. For the current year, up to the end of June, the company's profits, including profit on exchange, were up £4,700, and a corresponding improvement might be expected for the remainder of the year.

Leopoldina Railway Costs.—Mr. C. H. Pearson, addressing the stockholders of the Leopoldina Railway Company at the recent annual meeting, showed that the rate increases sanctioned by the Brazilian Government had produced in 1936 an additional revenue of £82,750, and the wages and holiday law costs which the rate increases were designed to cover had advanced by £81,640. The eight-hour law which came into force at the beginning of 1936, brought additional direct and indirect labour costs amounting to £53,000, and if the duties on imported coal and the increased pension fund contributions were added, there was a total of £70,000 which the company had had to bear without any form of compensation. It was hoped that more permanent relief measures would be sanctioned than the proposed loan of 23,500 contos for improvements and re-equipment. The company had uncomplainingly accepted the position during the depression, but now, with obvious recovery in Brazil, compensation could justly be asked for those burdens which could not be borne by the company without grave detriment to its proprietors. Under the moratorium scheme which had been sanctioned the company could postpone to January 1, 1939, the payment of interest on the first debenture stock and on the terminable debentures.

RAILWAY AND OTHER MEETINGS

Bombay, Baroda & Central India Railway Company

The one hundred and fiftieth general meeting of the Bombay, Baroda & Central India Railway Company was held at Southern House, Cannon Street, E.C.4, on July 21, Major A. D. G. Shelley, R.E., chairman of the company, presiding.

The Secretary (Mr. N. Lincoln) read the notice convening the meeting.

The Chairman, before dealing with the business of the meeting, referred to the great loss which the company had sustained in the death of Sir Henry Burt last October. Those who were privileged to work with him could testify to his intellectual and personal qualities and to the wide extent of his knowledge in all matters pertaining to Indian railways. His death had deprived the board of the services of an able and experienced colleague, with whom they had been associated for over twenty years. In moving the adoption of the report and accounts, the Chairman said that the total length of lines worked by the company was 3,511 miles. This mileage was 180 less than during the previous year, the reduction being due to the working of the Jaipur State Railway having been transferred to the Durbar of that State with effect from April 1, 1936. The capital account showed an expenditure of rather less than 14 lakhs of rupees, a reduction of about 8 lakhs as compared with last year. During the year the work of extending the electrified system from Borivli to Virar was completed, electrical working on that section having been inaugurated on September 1 last. Gross earnings amounted to eleven crores ninety-one lakhs, a figure which had not been reached since 1925-26. As compared with last year, goods earnings on both gauges showed a considerable increase and broad-gauge coaching traffic also improved; metre-gauge coaching earnings fell off, however.

Although, as a result of general prosperity and trade activity, they were able to look back on so successful a year, it should be recognised that their earnings were being seriously affected by road competition. This problem was discussed at some length in the recently published Report of the Committee, under the chairmanship of Sir Ralph Wedgwood. The recommendations of the Committee include a proposal that railways should have powers to run road services; this would entail a modification of the company's Act of Parliament and in all probability the board would in due course ask for the shareholders' authority to take the necessary steps in the matter. Sir Ralph Wedgwood's Committee dealt comprehensively with a number of questions affecting the prosperity of Indian railways, and he would take this opportunity of welcoming the publication of their very able Report.

The expenditure side of the account showed an increase of about 3½ lakhs as compared with last year and the percentage of working expenses to gross earnings was 52·5; it was a matter for congratulation that they should have worked to the lowest percentage for eighteen years.

So far as future prospects were concerned, he was glad to say that their gross earnings to date showed an increase of about 26 lakhs (7·7 per cent.) over last year. Although the steps necessary to meet road competition might well involve considerable expense, and a good deal of the traffic which they had lost could never be regained, a continuance of the company's prosperity might reasonably be anticipated.

The opening of the London Staff Gratuity Fund and the annual credit thereto of £4,000 had been approved at the general meeting held two years ago. This fund was intended to supplement the provident fund holdings of the London Staff in the event of the London office being closed through the termination of the company's contract. The reason for no credit appearing in the present accounts was that two members of the staff with long service had retired and were given gratuities.

The dividend recommended to be declared in respect of last year was at the usual rate of six per cent. After payment of this dividend and the ordinary charges debitable to revenue account, there would remain, as a result of the year's transactions, a net surplus of about £22,000 which would be added to the company's reserve funds.

The report and accounts were unanimously adopted.

Crossing Accident on Derwent Valley Light Railway.—The York Coroner, Col. Innes Ware, held an inquest on July 7 on the body of J. W. Lamb, killed at an accommodation crossing at Osbaldwick on July 5, when a Derwent Valley Light Railway train ran into his motor lorry. Mr. S. J. Reading, General Manager, said the train ran on Mondays only; persons using the crossing might not be aware of that. The gates were properly labelled and persons crossed at their own risk; the crossing was for the benefit of farmers, as the line bisected a field. From the left-hand side of the engine the view was largely obscured by disused station buildings. He could not see that they could issue instructions to drivers beyond the precautions they usually took. Evidence was given showing that Lamb was driving for the second time that day to some works under construction. He was going slowly, but what precautions he took were not seen and he appeared not to notice shouting. H. Cooper, fireman of the engine, said he shouted to his driver on seeing the lorry and he tried to stop; they struck the vehicle at about 20 m.p.h. J. A. Ratcliffe, the driver, saw nothing from his side of the footplate. A verdict of "accidental death" was returned.

RAILWAY AND OTHER REPORTS

Southern Railway.—The directors announce that for the half-year ended June 30, 1937, compared with the corresponding period of last year the receipts from passenger train traffic increased by £403,000, the receipts from goods traffic fell by £65,000, and railway working expenditure was higher by £188,000. The net receipts from steamboats, docks, harbours and wharves, hotels, interest, &c., show an increase of £60,000, and the net revenue for the half-year is approximately £210,000 more. The directors have decided to pay an interim dividend on the preferred ordinary stock of £2 per cent., which compares with £1 per cent. last year. Interim dividends of £2 10s. per cent. on the guaranteed preference and preference stocks, together with the interim dividend of £2 per cent. on the preferred ordinary stock, will be paid (less income tax) on August 12 next to those proprietors whose names were registered in the books of the company on July 6, the date when the balances were struck, and, unless payment has been directed in a different manner, the warrants will be posted on August 11.

Manchester Ship Canal Company.—The traffic receipts for the half-year ended June 30, 1937, amounted to £665,571, as compared with £650,965 for the corresponding period of last year, an increase of £14,606. The net revenue of the whole undertaking for the half-year (after providing for interest and fixed charges) was £10,978 more than for the first half of 1936.

Great Northern Railway (Ireland).—The board, after transferring a sum from reserves, has declared an interim dividend of £2 per cent. (less income tax) on the consolidated 4 per cent. guaranteed stock for the year 1937, which will be paid on September 1 next. The directors regret that the results for the half-year ended June 30, 1937, do not permit of the payment of any interim dividends on the preference and ordinary stocks.

Maidstone & District Motor Services Limited.—Controlled jointly by the Southern Railway Company and Tilling & British Automobile Traction Limited, this company secured for the year ended March 31, 1937, a profit of £114,570 (against £108,441 for 1935-36), to which must be added £20,723 brought forward from the previous year. The dividend on the 6½ per cent. cumulative preference shares takes £13,000, the dividend of 10 per cent. for the whole year on the ordinary shares takes £75,000, and the bonus of 1¼ per cent. on the ordinary shares takes £9,375. For the previous year the ordinary dividend was 12½ per cent., requiring only £57,500. For the year under review the sum of £15,103 (against £37,409) is allocated to the reserve fund, leaving £22,815 to be carried forward. During the year the authorised capital was increased by £300,000, of which £250,000 was issued as ordinary shares. The period covered by the accounts includes for the first time, a full year's trading of the business previously carried on by Autocar Services Limited. A contributory pension scheme was introduced in January, 1937.

Costa Rica Railway.—The report for the year to June 30, 1937, shows that the rental of £137,100 was received from the Northern Railway Company of Costa Rica for the working of the railway, and that the total net income, including interest on investments, &c., was £153,050. Debenture interest and other charges take £105,851, leaving a net profit of £47,199. A dividend of 2 per cent. on the capital stock is recommended, leaving £25,197 to be carried forward, against £13,998 brought in.

Chilean Northern Longitudinal Railway.—The report for the year 1936 shows that gross receipts amounted to £42,174, against £34,412 for the previous year. Passengers increased in number from 25,135 to 33,423, and of goods traffic 55,035 tons were conveyed, against 28,506 tons. The principal increases were in low grade ores, machinery for nitrate oficinas, and sulphur. The Antofagasta (Chili) & Bolivia Railway Company advanced, under the terms of the working agreement, the amount required to meet the loss on the operation of the railway and other charges, which was slightly less than for 1935. The total amount now due to the Antofagasta Company in respect of advances for 1936 and for previous years is £321,254.

Puerto Cabello & Valencia Railway.—Gross receipts for the year 1936 were £48,081, an increase of £438, and the working expenses were further reduced. Bus competition was severe and passenger revenue decreased by £1,000. Paying goods traffic improved by 550 tons, but the competing pipe line which may be completed by the end of 1937 is likely to reduce goods traffics. For the first six months of 1937 receipts show an advance over the same period of 1936. During the past 12 months a full 5 per cent. was paid to the debenture holders, and a further coupon was paid on Thursday, July 15, leaving only one year in arrear. The working agreement with the Bolivar Railway Company has been renewed for another ten years.

Egyptian Delta Light Railways.—After providing for debenture interest and all fixed charges the net profit for the year ended March 31 amounted to £2,130 (against £8,495 for 1935-36). This has been added to the sum carried forward, raising it to £47,234. In their report the directors state that during the year they came to an arrangement with the proprietors running motorbuses in districts served by the railway, which should to a considerable extent ameliorate the competition which has hitherto existed. Arrangements are now being made to form Egyptian companies to run the amalgamated motorbus services and to make applications to the Egyptian Government through such companies for concessions covering all routes alongside the company's lines.

Vickers Limited.—The directors give notice that the following interim dividends for the half-year ended June 30, 1937, will be paid on August 27: 2½ per cent. less income tax, on the preferred 5 per cent. stock; 2½ per cent. less income tax, on the 5 per cent. preference stock; 2½ per cent. free of income tax, on the cumulative preference stock.

Wagon Repairs Limited.—A profit of £91,768, after deducting depreciation and other charges, is reported for the year ended March 31, 1937, against £87,725 for the previous year. Adding £19,068 brought in gives a total of £110,836. Sums are deducted of £4,000 for tax, of £6,000 for contingencies, and of £1,884 for writing off capital reconstruction expenses. The dividend recommended on the ordinary shares is 10 per cent., and the amount to be carried forward is £20,371.

General Electric Co. Ltd.—Profits for the year ended March 31, 1937, amounted to £1,604,512, and adding £680,495 brought forward, gave a total of £2,285,007. After deducting £343,248 for depreciation, directors' fees £4,836, pension fund £45,569, £275,000 to taxation reserve and £125,455 to reserve, and preference dividends £190,569, there remains an available balance of £1,300,330. The directors recommend a dividend on the ordinary stock of 10 per cent. for the year (£314,878) and a bonus of 7½ per cent. (£236,158), leaving £749,294 to be carried forward. The company's works have been employed to full capacity. The inflow of orders has been extremely satisfactory, and a high level of output has been secured. In export business the volume of orders and shipments has shown further improvement. An issue of 381,670 ordinary shares at £3 a share was made during the year.

Gloucester Railway Carriage & Wagon Co. Ltd.—The directors report an improvement in the position regarding orders for the company's products, both as to volume of work and prices, but state that these are not yet fully reflected in the accounts for the year ended May 31 last. The wagon-hiring position was well maintained, but the general advance in expenses, particularly repair of wagons, is not yet fully met by increase in rents, many of which continue to run for fixed periods. These cannot be increased until existing hiring agreements expire. The company's subsidiary, Gloucester Foundry Limited, continues to make satisfactory profits. Net profits, after making the usual provision for depreciation, show an increase from £2,472 for 1935-36 to £9,201. The directors recommend a dividend of 2½ per cent. for the year and carry forward £7,026 (against £7,669). Previously no dividend had been declared since that for 1929-30.

NOTES AND NEWS

Royal Assents.—The Royal Assent was given on July 20 to the following Acts of 1937: Chairmen of Traffic Commissioners, etc. (Tenure of Office); London Passenger Transport Board.

North Eastern Airways Limited.—North Eastern Airways Limited has been elected to membership of the International Air Traffic Association, which includes all the main airline companies of Europe.

Faster to Scandinavia.—An air service between Esbjerg and Copenhagen has just been instituted for passengers travelling from Liverpool Street, L.N.E.R., to Scandinavia via Harwich and Esbjerg. The new air service saves four hours on the journey from London to Copenhagen, and also enables passengers from England to catch earlier connections to Stockholm, Gothenburg, and Oslo. Similar services are available in the reverse direction.

Swiss Measures to Attract Tourists.—Although the devaluation of the Swiss franc has attracted tourist traffic to flow back again into Switzerland, considerably more is being done in this direction by the recent 30 per cent. reduction in all fares for visitors staying in the country for at least six days. Motorists, too, are encouraged by a 30 per cent. refund on petrol, if they spend three or more days in Switzerland, up to a maximum of 66 gal. Frontier formalities are also being reduced.

Spanish Iron Ore Mines Requisitioned.—According to a Reuter telegram dated from Valencia on July 8, the Ministry of Finance and Economy had decreed on that date the requisition of the iron mines in the province of Almeria, the working of which has been at a standstill for some time. This no doubt refers to the mines at Seron and Alquife, which were the principal sources of the iron ore traffic of the Great Southern of Spain and Sur de España Railways. Both these lines were sezied by "workers' committees" after the outbreak of the civil war and have not since been under the control of the owning companies.

Serious Derailment on the East Indian Railway.—About 4 a.m. on July 17 an East Indian Railway Punjab-Calcutta express became derailed when approaching Bhita station, about 17 miles from Patna. Four coaches were telescoped, and the latest telegrams place the number killed, or died of injuries, at 107, none of them Europeans. In spite of the fact that an inquiry has already been held, the cause of this disaster has, so far as we are aware, not yet been ascertained. Although this is an area where deliberate attempts have from time to time been made to derail trains, sometimes with success but without such dire results, there appears, from the telegrams so far to hand, to be no proof of any such tampering with the track in this instance. (See also editorial note on page 138.)

Southern Electric Exhibition.—The Southern Railway has staged in the hall of Charing Cross underground station (L.P.T.B.), an exhibition showing salient features of its suburban and main-line electrification systems. Included in the exhibits are a working model of an electric train and another of colour-light signalling; a dead-man handle apparatus; and coach sections of the Portsmouth stock. The exhibition is to remain open until August 7.

Conveyance of Motor Cycles accompanying Passengers.—In order to avoid inconvenience to motor cyclists when travelling with their machines by train, the British railways have agreed to alter the regulations regarding the conveyance of motor cycles accompanying passengers by train so as to allow up to one quart of petrol to be carried in the tank of the motor cycle. This is conditional upon the flow of petrol to the carburetter being stopped and the carburetter emptied, that there is no leakage of petrol, and that all pressure has been released from the tank.

Northern Ireland Traffics.—Passenger receipts for the first three months of 1937 on railways wholly in Northern Ireland amounted to £46,619, against £44,473 for the corresponding period of 1936, but with a fall from 851,522 to 794,697 in the number of passengers (apart from season-ticket holders) carried. Merchandise and mineral tonnage for the three months fell from 169,021 tons to 143,514 tons, and the total goods traffic receipts from £61,405 to £53,436. Railways partly in Northern Ireland carried 964,249 ordinary passengers in the first quarter of 1937, against 1,038,180 in the first quarter of 1936, but total passenger receipts rose from £80,093 to £84,468. The quantity of merchandise and minerals carried fell from 247,633 tons to 230,366 tons, and total goods traffic receipts from £163,824 to £151,399. On the purely northern railways the number of livestock carried in the first quarter of 1937 rose from 35,551 to 51,654, but on the cross-border railways it fell from 168,829 to 159,738.

L.M.S.R. Posters.—To advertise the services of the Coronation Scot, the L.M.S.R. has issued a coloured poster by Bryan de Grineau showing the train at speed. The artist has found the colour and design of the express itself useful allies in producing a picture expressive of rapid motion, and relies upon these factors as the central interest of his poster. There is the merest glimpse of hills and heather in the background, and plenty of contrasting colour in the sky to pick the poster and its subject out from those around it wherever it is displayed. The times of the trains are shown at the foot, with suitable prominence given to the fact that the London-Glasgow journey is accomplished in 6½ hr. Another new L.M.S.R. poster, by "Sparrow," advertises Killarney with an attractive impression of lake and hill scenery. John Mace gives a study of Dolbadarn Castle, Llanberis, to illustrate the slogan "North Wales for Holidays"; and the L.M.S.R. and L.N.E.R. combine in the issue of a new Scottish holiday poster, in which Norman Wilkinson depicts a fishing scene in New Galloway.

Centenary of the "Great Western" Steamship Launch.—Mr. A. F. Moon, the Lord Mayor of Bristol, when presiding on Monday last at the annual meeting of the Bristol Chamber of Commerce and Shipping referred to the fact that it was exactly 100 years ago that the steamship *Great Western* was launched at Bristol. This vessel was built as the result of Brunel's suggestion to G.W.R. shareholders to "extend their line from Bristol to New York." The owning company was composed mainly of G.W.R. shareholders. Intense public interest was shown in the project, and some 20,000 persons were present at the launch on July 19, 1837.

The Model Engineer Exhibition, 1937.—The annual exhibition of engineering models, tools, and scientific equipment organised by *The Model Engineer* will be held at the Royal Horticultural Hall, Vincent Square, Westminster, from September 16 to 25. This will be the nineteenth exhibition of its kind. Many entries are being received in competition for the championship cups, medals, and other prizes. There are over 100 model engineering clubs throughout the country and some of their most representative work will be shown. The Royal Air Force will again be represented by an exhibit demonstrating its scheme of aircraft apprentice training. In the trade section there will be a complete display of lathes, light machine tools, and precision workshop equipment.

G.W.R. Royal Hotel, Paddington

Work has now been begun on the third and final stage of the complete modernisation of the G.W.R. Royal Hotel at Paddington station, which, when completed early next year, will provide provincial and overseas visitors to the Metropolis with one of the finest, most comfortable, and conveniently situated hotels in London.

The first stage was completed last year when a new wing comprising a large air-conditioned lounge, smoke room, cocktail bar, and 52 bedrooms (each with separate bathrooms and toilet), was brought into use. The second stage was finished in time for the Coronation. This work included the replanning, re-furnishing, and decoration of the bedrooms in the west wing, the dining room, and kitchens. The final stage will see the remaining bed-

rooms brought into line; new broad corridors linking the old and new buildings; the enlargement and remodelling of the entrance hall; and provision of a new grill room and large rooms for meetings and conferences. When completed the hotel will accommodate 250 visitors.

The alterations to the hotel have been carried out on a sweeping scale. The old coffee room has disappeared and in its place is a lofty "sunset glow" dining room seating 145. It is decorated simply and tastefully, with surprising mirror effects. Concealed lighting reflects a summer sunset glow all over the room and justifies its title. The colour scheme has been embodied in the china which is cream with red and blue lines.

The bedrooms are light and airy, and are decorated in pale pastel shades. The beds have box springs and Vi-spring mattresses; the built-in fitments are in a variety of woods from soft cream to dark walnut. An up-to-date "light" system of communication with the service rooms on each floor in lieu of the old bell system has been installed. Bathrooms are tiled to tone with the rooms, and fitted with built-in baths. Hot and cold running water is, of course, available throughout the hotel, which is also centrally heated.

In every room is an electric fire and silent clock controlled from the master clock in the stationmaster's office on No. 1 platform, which also controls all the station dials. A bedside telephone connects through the central switchboard with all the hotel services and the outside world. The barber's shop is fitted with the most modern equipment. A ladies' hairdressing saloon is also to be provided. A valet service on up-to-date American lines is also available to visitors for pressing, cleaning, and minor repairs.

The kitchens are the last word in equipment, layout, refrigeration, and efficiency. The walls and floors are tiled, and modern lighting and large windows make them light and airy and ensure the staff, who have their own dressing and mess rooms, working under ideal conditions.

British and Irish Traffic Returns

GREAT BRITAIN	Totals for 28th Week.			Totals to Date.		
	1937	1936	Inc. or Dec.	1937	1936	Inc. or Dec.
	£	£	£	£	£	£
L.M.S.R. (6,871½ mls.)						
Passenger-train traffic...	727,000	682,000	+ 45,000	13,489,000	12,946,000	+ 543,000
Merchandise, &c. ...	493,000	476,000	+ 17,000	13,726,000	13,323,000	+ 403,000
Coal and coke ...	216,000	219,000	– 3,000	7,305,000	6,814,000	+ 491,000
Goods-train traffic ...	709,000	695,000	+ 14,000	21,031,000	20,137,000	+ 894,000
Total receipts	1,436,000	1,377,000	+ 59,000	34,520,000	33,083,000	+1,437,000
L.N.E.R. (6,315 mls.)						
Passenger-train traffic...	472,000	445,000	+ 27,000	8,819,000	8,418,000	+ 401,000
Merchandise, &c. ...	336,000	329,000	+ 7,000	9,479,000	9,058,000	+ 421,000
Coal and coke ...	228,000	212,000	+ 16,000	6,990,000	6,540,000	+ 450,000
Goods-train traffic ...	564,000	541,000	+ 23,000	16,469,000	15,598,000	+ 871,000
Total receipts	1,036,000	986,000	+ 50,000	25,288,000	24,016,000	+1,272,000
G.W.R. (3,738½ mls.)						
Passenger-train traffic...	283,000	279,000	+ 4,000	5,602,000	5,417,000	+ 185,000
Merchandise, &c. ...	201,000	195,000	+ 6,000	5,520,000	5,318,000	+ 202,000
Coal and coke ...	111,000	98,000	+ 13,000	3,140,000	2,811,000	+ 329,000
Goods-train traffic ...	312,000	293,000	+ 19,000	8,660,000	8,129,000	+ 531,000
Total receipts	595,000	572,000	+ 23,000	14,262,000	13,546,000	+ 716,000
S.R. (2,157 mls.)						
Passenger-train traffic...	402,000	379,000	+ 23,000	8,556,000	8,099,000	+ 457,000
Merchandise, &c. ...	63,500	64,500	– 1,000	1,699,000	1,752,000	– 53,000
Coal and coke ...	25,500	29,500	– 4,000	855,000	868,000	– 13,000
Goods-train traffic ...	89,000	94,000	– 5,000	2,554,000	2,620,000	– 66,000
Total receipts	491,000	473,000	+ 18,000	11,110,000	10,719,000	+ 391,000
Liverpool Overhead ... (6¼ mls.)	1,482	1,261	+ 221	35,568	32,494	+ 3,074
Mersey (4½ mls.) ...	4,015	3,824	+ 191	117,030	112,890	+ 4,140
*London Passenger Transport Board ...	566,500	554,500	+ 12,000	1,710,500	1,692,700	+ 17,800
IRELAND						
*Belfast & C.D. pass. (80 mls.)	7,570	6,638	+ 932	66,386	68,687	– 2,301
,, ,, goods	359	372	– 13	13,961	15,673	– 1,712
,, ,, total	7,929	7,010	+ 919	80,347	84,360	– 4,013
Great Northern pass. (543 mls.)	21,100	19,750	+ 1,350	274,300	273,050	+ 1,250
,, ,, goods	8,350	8,700	– 350	263,200	278,000	– 14,800
,, ,, total	29,450	28,450	+ 1,000	537,500	551,050	– 13,550
Great Southern pass. (2,076 mls.)	46,638	46,618	+ 20	903,461	913,803	– 10,342
,, ,, goods	37,098	36,878	+ 220	1,146,764	1,159,682	– 12,918
,, ,, total	83,736	83,496	+ 240	2,050,225	2,073,485	– 23,260

* 3rd Week (before pooling). † 29th Week.

British and Irish Railway Stocks and Shares

Stocks	Highest 1936	Lowest 1936	Prices July 21, 1937	Rise / Fall
G.W.R.				
Cons. Ord. ...	64¼	45½	63½	–1
5% Con. Prefce. ...	126½	116¾	117½	—
5% Red. Pref. (1950)	113	108½	111½	—
4% Deb.	119½	110½	105½	—
4½% Deb.... ...	121	114	111	—
4½% Deb.... ...	129	121	117½	—
5% Deb.	141	134	128½	—
2½% Deb.... ...	79⅛	74	69½	—
5% Rt. Charge ...	136½	130	127½	—
5% Cons. Guar. ...	135¼	127¾	126	—
L.M.S.R.				
Ord.	35⅝	17	33½	–½
4% Prefce. (1923)	83	52½	78½	–½
4% Prefce. ...	92¾	81	86	–1
5% Red. Pref. (1955)	109¼	103¼	105	—
4% Deb.	111¾	105 9/16	102	—
5% Red. Deb. (1952)	119⅝	115½	112½	—
4% Guar. ...	106¾	101⅝	100	—
L.N.E.R.				
5% Pref. Ord. ...	14	9	10	–½
Def. Ord.	7¼	4¾	5	–¼
4% First Prefce.	79¼	55¼	73	–½
4% Second Prefce.	31⅞	18¼	27	–1
5% Red. Pref. (1955)	100½	77¾	96	—
4% First Guar. ...	104½	98¾	98½	—
4% Second Guar.	99	90	91½	—
3% Deb.	85¾	79	76	—
4% Deb.	109¾	104½	101	—
5% Red. Deb. (1947)	116¼	110½	109½	—
4½% Sinking Fund Red. Deb.	111½	107½	107	—
SOUTHERN				
Pref. Ord.... ...	98¾	82½	93	—
Def. Ord.	27⅝	20⅛	22	–¼
5% Pref.	120¾	118½	116½	—
5% Red. Pref. (1964)	119¾	115¼	115½	—
5% Guar. Prefce.	136	129½	127	—
5% Red. Guar. Pref. (1957)	120	115¾	115½	—
4% Deb.	117 5/16	109½	103½	—
5% Deb.	140	134	126½	—
4% Red. Deb. 1962–67	116½	110	106½	—
BELFAST & C.D.				
Ord.	9	4½	4	—
FORTH BRIDGE				
4% Deb.	107	105	101½	—
4% Guar. ...	107 5/16	104	100½	—
G. NORTHERN (IRELAND)				
Ord.	19½	9¾	7	—
G. SOUTHERN (IRELAND)				
Ord.	63	41	34	—
Prefce.	65	46	40½	–6
Guar.	97¼	81	72¼	—
Deb.	99¾	83¼	86½	+½
L.P.T.B.				
4½% "A" ...	127¾	121	115½	–1
5% "A"	138¼	133½	125½	—
4½% "T.F.A." ...	111½	108⅛	105	—
5% "B"	131¾	123¾	117½	—
"C"	112½	93	81	+1½
MERSEY				
Ord.	40¾	23	26½	–1
4% Perp. Deb. ...	103	98	97*	–2
3% Perp. Deb. ...	78	74⅝	74½*	–1
3% Perp. Prefce.	68⅞	63¼	65½	—

* ex dividend

CONTRACTS AND TENDERS

The Metropolitan-Cammell Carriage & Wagon Co. Ltd. has received an order from the Crown Agents for the Colonies for four first class coaches for the Gold Coast Government Railway.

The four coaches comprising the above order for the Gold Coast Government Railway, as in the case of similar stock ordered for this administration, are to be fitted with G. H. Sheffield & Co. (Engineers) Limited patent Sheffield-Twinberrow bogies.

Craven's Railway Carriage & Wagon Co. Ltd. has received an order from the Rhodesia Railways for three bogie brake vans.

Locomotives for India

Berliner Maschinenbau A.G. has received an order from the Bikaner State Railway Administration, to the inspection of Messrs. Rendel, Palmer & Tritton, for the supply of four metre-gauge YB class 4-6-2 superheated passenger locomotives and tenders.

J. Baker & Bessemer Limited has received an order for 300 steel tyres for carriages and wagons from the Central Argentine Railway.

Tarran Industries Limited has received a contract from the L.N.E.R. for the modernisation of the Grand Hotel, West Hartlepool. The hotel is to be redecorated, and a new cocktail bar, lounge, and cloakroom are to be provided together with additional bedrooms. Running water will be fitted in every bedroom, and the number of bathrooms is also to be increased. Kitchens and service rooms are to be re-equipped with the latest types of cooking appliances, and new quarters are to be provided for the staff.

D. Wickham & Co. Ltd. has received a repeat order from the Central Argentine Railway for one petrol-driven motor gang trolley.

Samuel Osborn & Co. Ltd. has received an order from the South Indian Railway Administration to the inspection of Messrs. Robert White & Partners for 660 laminated springs for locomotives.

The Birmingham Railway Carriage & Wagon Co. Ltd. has received an order from the Crown Agents for the Colonies for five four-wheeled brake vans required for the Kenya & Uganda Railways.

J. Parkinson & Sons has received an order for one No. 3 T universal milling machine for the Buenos Ayres Western Railway.

The Hydraulic Coupling & Engineering Co. Ltd. has received an order from the New South Wales Government Railways for two scoop tube hydraulic couplings for fans absorbing 300 b.h.p. installed in the Newcastle power station.

Bayliss, Jones & Bayliss Limited has received an order for 90,000 steel fish-bolts, nuts, and washers for 85-lb. rails for the Central Argentine Railway.

Reconstruction of High Street, Kensington Station, L.P.T.B.

London Transport has placed a contract for an important station reconstruction scheme at High Street, Kensington. The work will include a new booking hall with a passimeter ticket office, two banks of ticket machines, a telephone lobby, and showcases. The new booking hall will be situated farther over the platforms than the existing ticket office and will adjoin a new bridge with stairways to the platforms. Showcases will be made symmetrical so that there may be an octagonal display hall. The removal of the present ticket office and the transference of the telephone booths from the entrance arcade to the new ticket hall will clear the way to the platforms. On the bridge, lavatory accommodation and a left luggage office will be built. The stairs to the platforms will have landings half-way. There will be two flights of stairs to the busiest platform, No. 1, which will enable passengers to distribute themselves more evenly along the platform. The island platforms, Nos. 2 and 3, will be widened.

New Depot for Grange Hill, L.P.T.B.

Haymills (Contractors) Limited has received a contract from London Transport for the construction of a railway depot at Grange Hill. There will be accommodation for 304 of the larger modern type railway cars to be used on the reconstructed and extended Central London Line. These cars will not only have considerably more accommodation, but they will be coupled differently so that four-car trains may run in the slack hours. The contract provides for the completion of the depot within six months. Plans are being drawn for a corresponding depot on the western extension of the line at Ruislip.

Bochumer Verein A.G. has received an order for 1,200 steel spiral springs for wagons for the Cordoba Central Railway.

Balmer, Lawrie & Co. Ltd. has received orders from the Chief Controller of Stores, Indian Stores Department, Simla, for 82 cwt. of mild steel galvanised and 684¾ cwt. of galvanised corrugated iron sheets.

The Bombay, Baroda & Central India Railway Administration has placed the following orders, to the inspection of Messrs. Rendel, Palmer & Tritton :—

Hill & Johnson Limited, 1,600 helical springs.

Chloride Electrical Storage Co. Ltd., 208 elements and 16 cells required for a battery shunting locomotive and 396 lead train-lighting accumulators.

Thomas Firth & John Brown Limited, 150 laminated springs.

William Beardmore & Co. Ltd., 732 wagon axles.

Surahammars Bruks, 1,464 tyres.

The Assam-Bengal Railway Administration has placed orders, to the inspection of Messrs. Rendel, Palmer & Tritton, with Ruhrstahl A.G. for 300 carriage and wagon axles and with the Churchill Machine Tool Co., Ltd., for one axle journal re-grinding machine.

The Solem Hardware Mart has received orders from the Great Indian Peninsula Railway for six flanged copper locomotive tubeplates, to be manufactured on the Continent.

John Lang & Sons Limited has received an order for one 12½-in. centres sliding, surfacing, and screw-cutting gap bed lathe for the Buenos Ayres Western Railway.

Brazilian railways are reported to have bought 17,000 tons of steel rails from steel companies in the United States.

The South Indian Railway Administration invites tenders receivable at 91, Petty France, Westminster, S.W.1, by August 6, for the supply of solid-drawn steel boiler tubes, steel tyres and rolled steel disc wheels and axles.

Locomotive Breakdown Cranes Required

The Royal State Railways of Siam are calling for tenders (Tender No. B.E.2480) for the supply and delivery of two locomotive breakdown cranes worked by steam or heavy oil engines, and two match trucks. Each crane should be capable of lifting a load of 25 tons at an approximate radius of 5 m., and 12 tons at an approximate radius of 7 m. when blocked up on outrigger girders. The gauge of the railways is 1 m. Tenders endorsed "Tender for Locomotive Cranes and Match Trucks B.E. 2480" should reach the Superintendent of Stores, Central Office of Stores, Royal State Railways, Bangkok, Siam, by October 29. A copy of the specifications and general conditions of tender, together with drawings, may be borrowed from the Department of Overseas Trade, London, S.W.1.

The South African Railways & Harbours Administration is calling for tenders (Tender No. 1347), receivable in Johannesburg by August 9, for the supply and delivery of quantities of steel tyres (engine and tender) and axles (engine, tender, carriage, and wagon). A copy of the schedule of quantities, specification, and general conditions of contract may be borrowed from the Department of Overseas Trade, London, S.W.1.

The South African Railways & Harbours Administration is calling for tenders (Tender No. 1354), receivable by August 23, for the supply and delivery of quantities of seamless copper pipes for locomotives, in 12 ft. to 16 ft. lengths (1938 requirements).

The South African Railways & Harbours Administration is calling for tenders, to be presented in Johannesburg by August 30, for the supply of 16 4-ton, alternatively 15 4-ton and one 10-ton, level luffing electric portal travelling wharf cranes for Durban Harbour.

The Turkish Ministry of Public Works is reported to have received a grant from the National Assembly of approximately £2,500,000 for the improvement of the rolling stock of the Turkish State Railways.

OFFICIAL NOTICES

WANTED FOR INDIA.—Personal Assistant to General Manager. A vacancy offering exceptional prospects of rapid promotion, occurs with one of the largest Engineering Works of repute in India, engaged on general engineering work and having foundry, railway rolling stock and bridge and structural departments, for a mechanical engineer with experience of Works management. Applicants should be about 38 years of age, of good general and technical education, and should have had similar experience in a well-known engineering works in Europe. Salary according to qualifications (about £115 per month) with five years agreement, free passages, provident fund, and generous Home leave on renewal of contract.—Apply, by letter, with copies of testimonials, and details of experience, stating age, and whether married or single to Box No. 207, c/o THE RAILWAY GAZETTE, 33, Tothill Street, Westminster, S.W.1.

WANTED FOR INDIA.—Works Inspector for large Wagon Works to take charge of Works Inspection Dept. Applicants should have had experience of inspection of railway rolling stock in a well-known Works in this country, and should be competent to undertake the inspection of component parts and completed steel carriage frames and wagons. They should be familiar with the testing of materials, and should have had good general and technical education. Salary about Rs. 700 per month, five year agreement, free passages, and provident fund, and free unfurnished quarters. Apply, by letter, with copies of testimonials, and stating age, and whether married or single to Box No. 217, c/o THE RAILWAY GAZETTE, 33, Tothill Street, Westminster, S.W.1.

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Mansion House Association on Transport Visits Southampton

At the invitation of the Southern Railway Company a party of members of the Mansion House Association on Transport visited Southampton on Wednesday last, July 21. They were shown the admirable facilities there for ocean and cross-Channel passengers, shippers and manufacturers. Those present included :—

Messrs. A. L. Bagley (J. Wix & Sons Ltd.), E. A. Bond (Price's Patent Candle Co. Ltd.), G. A. E. Burgess and A. G. Burgess (Schweppes Limited), E. Burrow (Commercial Asst. to Docks Manager, S.R.), W. A. Brown (latterly London Dist. Freight Supt., S.R.), Lt.-Col. P. M. Brooke-Hitching, Messrs. H. C. Crane (J. Lyons & Co. Ltd.), H. E. Cross (Kodak Limited), A. Cunliffe (Reckitt & Sons Ltd.), A. J. Cullis (Gloucester Docks), R. L. Davies (Rockware Glass Syndicate Limited), C. R. Dixon (Glaxo Laboratories Limited), J. Draper (Rockware Glass Syndicate Limited), S. Derry (Development Asst. to Traffic Manager, S.R.), J. B. Elliot (Assistant Traffic Manager, S.R.), W. H. Gaunt (President of Mansion House Association), Miss L. M. Green (Berry Wiggins & Co. Ltd.), Messrs. W. Griffin (Saml. Hanson & Son Ltd.), S. Gunn (Kodak Limited).

Messrs. E. R. Harris (Cerebos Limited), H. J. Healey (Associated Portland Cement Manufacturers), E. A. Hilder (McDougalls Limited), A. E. Hammett (Deputy Commercial Asst. to Traffic Manager, S.R.), E. Hight (Southern Divisional Supt., S.R.), J. L. Harrington (General Asst. to Traffic Manager, S.R.), J. Jones (Chiswick Products Limited), A. B. Jones (Seager Evans & Co. Ltd.), C. F. King (Bryant & May Limited), R. H. Kitson (Edmundson's Electricity Corp. Ltd.), J. A. Kay (THE RAILWAY GAZETTE), C. N. Lidguard (Davies & Robson), D. R. Lamb (*Modern Transport*), A. H. Lingard (latterly Commercial Assistant, S.R.), E. J. Missenden (Traffic Manager, S.R.), O. Massey (Scribbans & Co. Ltd.), Councillor J. H. Meachin (Manchester Corporation), J. Mitchell (Carr & Co. Ltd.), J. Marlow (Ardath Tobacco Co. Ltd.).

Messrs. S. R. Newcombe (Divisional Marine Manager, S.R.), A. H. Petford (Anglo-American Oil Co. Ltd.), W. J. Phillipson (George Cohen Sons & Co. Ltd.), A. H. Pirie (James Pascall, Limited), W. M. Perts (Commercial Assistant, S.R.), E. G. Rayson (Rowntree & Co. Ltd.), R. M. T. Richards (Development Officer, S.R.), E. B. Saunders (Pinchin, Johnson & Co. Ltd.), W. A. Shepherd (Nestle's Milk Products Limited), C. Smith (Spillers Limited), G. H. Searle (Hall & Co. Ltd.—Hon. Sec. M.H.A.), H. A. Short (Asst. Docks and Marine Manager, S.R.), W. J. Shorter (Development Dept., S.R.), E. Tufnell (Cooper, McDougall & Robertson, Limited), H. Turvey (Associated Portland Cement Manufacturers), J. Wall (Army & Navy Stores Limited), H. Wales (Ardath Tobacco Co. Ltd.), Miss M. S. Watling (Asst. Secretary, M.H.A.), Messrs. E. Watts (Crosse & Blackwell Limited), A. White (latterly Divisional Supt. S.R.), E. Young (Hadfield's (Merton) Limited), E. E. Young (London Dist. Freight Supt., S.R.).

Leaving Waterloo at 9.30 on the down journey, the train called intermediately at Surbiton, Woking, Basingstoke and Winchester, and the station reconstruction works now in progress at the first two stations were noted. Southampton Central station has recently been completely rebuilt and is now one of the finest in the country. On their way to the King George V graving dock the large mill of Joseph Rank Limited and the reclaimed land now available for the erection of factories were seen to advantage from the Herbert Walker Avenue. A visit was made to the pump house and the party was conducted through one of the new transit sheds and thence to the international cold store, from the roof of which the departure of R.M.S. *Queen Mary* for New York, from the adjacent ocean dock, was witnessed. The party was then conducted to the outer dock and entertained to luncheon on board the *Isle of Jersey*, one of the latest of the 41 ships owned by the Southern Railway.

Mr. W. H. Gaunt, Traffic Manager, J. Lyons & Co. Ltd., and President of the Mansion House Association on Transport, expressed the thanks of those present for the most interesting and instructive morning they had had at Southampton. He was supported by Councillor J. H. Meachin (Manchester Corporation) and Mr. O. Massey (Scribbans & Co. Ltd.).

Mr. E. J. Missenden, in replying, said that he had attended a recent meeting of the Mansion House Association on Transport, and as a result of this he had thought that it would be interesting for the members to have an opportunity of inspecting the developments which had recently taken place at Southampton and obtain some idea of the facilities available for the handling of all classes of traffic.

After lunch a visit was paid to the Merchant Navy Week Exhibition which has been organised by the Mission to Seamen and, by courtesy of the Southern Railway, is being held in one of the buildings adjoining the Ocean quay.

NAVY EXHIBITS AT RAILWAY STATIONS AND OFFICES.—In order to draw attention to Navy Week, which will be held in the Royal Dockyards at Chatham, Plymouth, and Portsmouth, on July 31, and August 2 to 7 inclusive, there are now on view some interesting exhibitions in London, and at provincial railway stations and ticket bureaux. At the head of the main line departure platforms at Waterloo station, is a beautiful model, 8 ft. square, of Portsmouth dockyard. It is a 100 ft. to 1 in. scale model, perfect to minute detail, of the Naval ships, docks, basins, jetties, and buildings, on which are clearly shown the positions of all the features of Navy Week at Portsmouth. Scale models, from 7 ft. to 16 ft. long, of great ships of the Royal Navy are being exhibited, in London, at the Southern Railway stations at Charing Cross, Victoria, and Wimbledon ; and in the windows of the G.W.R. ticket offices in Oxford Street and Trafalgar Square ; and in the provinces, at the L.M.S.R. stations in Birmingham, Nottingham, Bristol, and Leicester ; the L.N.E.R. stations in Lincoln, Norwich, and Cambridge ; and the G.W.R. stations in Birmingham, Cardiff, Bristol, and Newton Abbot. No charge is made for seeing these exhibitions, and they will be on view until August 7, Sundays included. They represent the actual ships which the public will be able to inspect during Navy Week.

LONG WELDED RAILS ON THE SOUTHERN RAILWAY.—The type of steel key used with the 180-ft. rails, the laying of which in Merstham Quarry tunnel we described in our last issue, was the Turplat manufactured by George Turton, Platts & Co. Ltd. In the diagram on page 115, showing the positions of the welding sites, the designation of the up and down lines was, unfortunately, transposed. The up line runs from Earlswood towards Coulsdon North.

Railway Share Market

The stock and share markets have been exceedingly quiet, and despite further favourable traffic receipts, Home railway junior stocks were moderately reactionary. Had markets been active, prices would no doubt have shown a much better trend, although there is a growing disposition for intending buyers to await not only the half-yearly statements but also the decisions regarding higher wages and increased transport charges.

Chief attention was given to L.M.S. ordinary on last week's traffic gain, but on balance rather lower prices were made by the junior preference issues as well as the ordinary stock. L.N.E.R. second preference was unresponsive to the very satisfactory traffic gain, as was the first preference, despite the belief expressed in many quarters that the yield offered by the latter appears to be unduly generous. Great Western ordinary was fairly steady, although best prices were not retained. Some market men are now estimating that earnings on this stock may be around 4½ per cent. for the current year. If this hope appears to be warranted by the statement for the first six months, there will no doubt be increased anticipations of a minimum total payment of 3½ per cent. for the year. Southern deferred and preferred were out of favour in advance of the half-yearly statement. There are growing hopes that the railway's receipts will benefit increasingly from expansion in tourist traffic. More favourable views as to the dividend outlook continued to bring in buyers of London Transport "C" stock, and the price made further recovery.

South American railway stocks had a steadier appearance, but were reported to be very inactive as a result of general market conditions. The preference stocks were out of favour in various cases and tended to lower prices, but B.A. Gt. Southern, Central Argentine and B.A. Western ordinary stocks were inclined to improve later in the week, the general assumption being that the progress of these railways should be accelerated considerably during the current financial year. Elsewhere, San Paulo reacted owing to talk that the line may have to face competition in the future, while Antofagasta also moved against holders. Various American railroad stocks responded moderately to the better tendency of New York markets, but Canadian Pacific made a lower price.

Traffic Table of Overseas and Foreign Railways Publishing Weekly Returns

	Railways	Miles open 1936-37	Week Ending	Traffics for Week: Total this year	Traffics for Week: Inc. or Dec. compared with 1936	No. of Weeks	Aggregate Traffics to Date: Totals: This Year	Aggregate Traffics to Date: Totals: Last Year	Aggregate Traffics to Date: Increase or Decrease	Shares or Stock	Prices: Highest 1936	Prices: Lowest 1936	Prices: July 21, 1937	Prices: Yield (See Note)
				£	£		£	£	£					
South & Central America	Antofagasta (Chili) & Bolivia	834	18.7.37	15,880	+ 2,040	29	470,400	392,400	+ 78,000	Ord. Stk.	25	15¼	19	Nil
	Argentine North Eastern	753	17.7.37	10,093	+ 368	3	23,666	22,672	+ 994	„	12	2	10½	Nil
	Argentine Transandine	—	—	—	—	—	—	—	—	A. Deb.	54	45	85	4 11/16
	Bolivar	174	June, 1937	5,700	— 500	26	35,000	41,000	— 6,000	6 p.c. Deb.	9	5	8½	Nil
	Brazil	—	—	—	—	—	—	—	—	Bonds.	16	11½	16	3⅛
	Buenos Ayres & Pacific	2,806	17.7.37	83,313	+ 6,381	3	200,869	191,788	+ 9,081	Ord. Stk.	17½	6	10	Nil
	Buenos Ayres Central	190	26.6.37	$164,800	+ $53,100	52	$7,405,700	$5,554,400	+ $1,851,300	Mt. Deb.	31½	11	30	Nil
	Buenos Ayres Gt. Southern	5,084	17.7.37	122,643	+ 14,212	3	282,258	276,617	+ 5,641	Ord. Stk.	31¾	13⅝	25	Nil
	Buenos Ayres Western	1,930	17.7.37	47,457	+ 5,595	3	106,575	99,543	+ 7,032	„	29¾	11	22½	Nil
	Central Argentine	3,700	17.7.37	155,555	+ 25,502	3	376,457	319,133	+ 57,324	„	32 29/32	8⅝	25	Nil
	Do.	—	—	—	—	—	—	—	—	Dfd.	21	4½	12	Nil
	Cent. Uruguay of M. Video	980	10.7.37	15,049	+ 136	2	20,976	23,817	— 2,841	Ord. Stk.	7⅝	3	6½	Nil
	Cordoba Central	1,218	17.7.37	42,620	+ 5,500	3	107,940	95,100	+ 12,840	Ord. Inc.	5	1	4½	Nil
	Costa Rica	188	May, 1937	25,954	+ 8,505	48	218,282	159,922	+ 58,360	Stk.	36½	32	34 2/8	5 13/16
	Dorada	70	June, 1937	14,000	+ 400	26	90,400	79,300	+ 11,100	1 Mt. Db.	107	101½	104½	5⅜
	Entre Rios	810	17.7.37	14,634	+ 1,824	3	33,108	29,711	+ 3,397	Ord. Stk.	17	6	11	Nil
	Great Western of Brazil	1,092	17.7.37	5,900	—	29	210,700	223,800	— 13,100	Ord. Sh.	1/2	5/16	1/2	Nil
	International of Cl. Amer.	794	May, 1937	$592,447	+ $55,571	22	$2,787,690	$2,617,518	+ $170,172	—	—	—	—	—
	Interoceanic of Mexico	—	—	—	—	—	—	—	—	1st Pref.	1/2	-/6	1/2	Nil
	La Guaira & Caracas	22¾	June, 1937	5,370	+ 910	26	33,705	27,340	+ 6,365	Stk.	9	3	7½	Nil
	Leopoldina	1,918	17.7.37	23,373	+ 2,125	29	637,466	493,554	+ 143,912	Ord. Stk.	10½	3½	5	Nil
	Mexican	483	14.7.37	$275,100	+ $46,400	2	$530,800	$455,000	+ $75,800	„	1¼	1/4	1/2	Nil
	Midland of Uruguay	319	June, 1937	9,268	+ 1,677	52	105,596	86,425	+ 19,171	„	1½	1/8	1/2	Nil
	Nitrate	384	15.7.37	2,908	— 3,587	28	89,753	76,055	+ 13,698	Ord. Sh.	63/6	41/9	2/3	Nil
	Paraguay Central	274	17.7.37	$4,190,000	+ $1,600,000	3	$9,895,000	$6,807,000	— $3,088,000	Pr. Li. Stk.	85	71	80½	7 7/16
	Peruvian Corporation	1,059	June, 1937	79,279	— 3,845	52	987,424	949,493	+ 37,931	Pref.	15	9	11	Nil
	Salvador	100	10.7.37	¢12,450	+ ¢2,635	2	¢17,582	¢16,443	+ ¢1,139	Pr. Li.Db.	18	16	22½	Nil
	San Paulo	153½	11.7.37	33,867	+ 6,864	28	910,462	816,697	+ 93,765	Ord. Stk.	86	46½	88½	5⅝
	Taltal	164	June, 1937	3,115	— 1,105	52	41,035	42,725	— 1,690	Ord. Sh.	11 5/32	14/-	11⅜	8⅞
	United of Havana	1,353	17.7.37	19,620	+ 3,234	3	45,702	41,705	+ 3,997	Ord. Stk.	3¼	1	3	Nil
	Uruguay Northern	73	June, 1937	836	+ 34	52	11,695	9,941	+ 1,754	Deb. Stk.	5	3	9	Nil
Canada	Canadian National	23,773	14.7.37	754,150	+ 51,495	28	20,454,835	18,437,363	+ 2,017,472	—	—	—	—	—
	Canadian Northern	—	—	—	—	—	—	—	—4 p.c.	Perp. Dbs.	76	51	68	5⅞
	Grand Trunk	—	—	—	—	—	—	—	—	4 p.c. Gar.	104¾	99¾	99½	4
	Canadian Pacific	17,228	14.7.37	535,000	+ 34,600	28	14,420,400	13,455,400	+ 965,000	Ord. Stk.	16¾	10 15/16	12	Nil
India†	Assam Bengal	1,329	30.6.37	37,402	+ 2,686	13	322,993	310,259	+ 12,734	Ord. Stk.	87¾	82¼	75½	4
	Barsi Light	202	20.6.37	2,460	— 285	12	27,487	27,832	— 345	Ord. Sh.	77½	65½	48	10 7/16
	Bengal & North Western	2,111	30.6.37	80,042	+ 8,009	13	813,520	754,128	+ 59,392	Ord. Stk.	319	292 5/8	304	5 5/16
	Bengal Dooars & Extension	181	30.6.37	4,448	+ 824	13	30,748	29,886	+ 862	„	127½	118	97½	5⅝
	Bengal-Nagpur	3,268	30.6.37	177,675	+ 7,772	13	1,806,625	1,654,934	+ 151,691	„	104	100¼	90½	4 7/16
	Bombay, Baroda & Cl. India	3,072	10.7.37	214,350	+ 17,475	14	2,706,075	2,511,525	+ 194,550	„	114	110½	111½	5⅜
	Madras & Southern Mahratta	3,229	30.6.37	162,525	+ 9,334	13	1,515,525	1,501,384	+ 14,141	„	116½	108½	108½	7⅜
	Rohilkund & Kumaon	561	30.6.37	13,561	+ 1,578	13	156,138	158,706	— 2,568	„	311	286	304	5 15/16
	South Indian	2,531¾	20.6.37	110,830	— 1,870	12	939,991	941,074	— 1,083	„	107½	102 5/16	100½	5½
Various	Beira-Umtali	204	May, 1937	84,161	+ 13,984	35	585,391	513,150	+ 72,241	—	—	—	—	—
	Egyptian Delta	620	10.6.37	6,234	+ 616	10	43,418	39,590	+ 3,828	Prf. Sh.	21/4	15/8	1 3/8	Nil
	Great Southern of Spain	—	—	—	—	—	—	—	—	Inc. Deb.	1½	1/8	3½	Nil
	Kenya & Uganda	1,625	May, 1937	216,935	— 20,539	22	1,334,126	1,229,899	+ 104,227	—	—	—	—	—
	Manila	—	—	—	—	—	—	—	—	B. Deb.	50½	37	45	7⅝
	Midland of W. Australia	277	May, 1937	11,590	— 359	48	144,239	149,411	— 5,172	Inc. Deb.	97	93½	95	4 5/16
	Nigerian	1,905	29.5.37	52,206	+ 26,384	9	531,628	275,157	+ 256,471	—	—	—	—	—
	Rhodesia	2,451	May, 1937	411,689	+ 122,936	35	2,932,177	2,295,006	+ 637,171	4 p.c. Db.	107	103½	107½	3⅝
	South Africa	13,263	3.7.37	681,871	+ 36,470	14	8,426,395	7,865,898	+ 560,497	—	—	—	—	—
	Victoria	4,728	Nov., 1936	868,988	+ 45,953	21	3,995,540	3,959,297	+ 36,243	—	—	—	—	—
	Zafra & Huelva	112	May., 1937	12,899	+ 4,079	22	70,216	48,574	+ 21,642	—	—	—	—	—

NOTE.—Yields are based on the approximate current prices and are within a fraction of 1/16.

† Receipts are calculated @ 1s. 6d. to the rupee. § ex dividend. Salvador and Paraguay Central receipts are in currency.

The variation in Sterling value of the Argentine paper peso has lately been so great that the method of converting the Sterling weekly receipts at the par rate of exchange has proved misleading, the amount being overestimated. The statements are based on the current rates of exchange and not on the par value.

Electric Railway Traction

The Italian Streamliners

THE conception of the new electric streamlined trains of the Italian State Railways dates back to 1934, when extensive developments of the 3,000-volt d.c. system had been sanctioned, but it was some time before the characteristics of the new units were settled, more particularly as regards the type of seating accommodation to be provided. The first scheme was for a three-car train to seat 192 passengers in one class, and to be equipped with four 150 kW. motors to give a speed of 80 m.p.h. on the level. The estimated tare weight for this train was the modest total of 72 tons. Eventually it was decided to build some three-car articulated sets on something approaching *de luxe* lines, and it is these rakes which are operating now on the Bologna—Florence—Rome—Naples trunk route at average start-to-stop speeds of 62 to 71 m.p.h. Compared with the original single-class design, the seating capacity (in two classes) is less than half, but the tare weight is 45 per cent. greater. These trains are classed as *rapidos*, and supplements are charged for their use, amounting to 23 lire first class and 15·5 lire second class between Florence and Rome, and to 17 and 11·5 lire respectively between Naples and Rome. The problems associated with the design and efficient operation were those already encountered in France and Europe, in addition to others peculiar to Italy. A good deal of trouble has been taken to get smooth riding over lines not otherwise suitable for very high speeds, and air-conditioning was deemed essential in view of the hot summer climate. In the electrical portion of the train a novelty has been introduced in the form of a double reduction gear drive from single-armature motors located on the bogies, and a modified form of Bianchi quill drive has been adopted. A further electrical problem was the collection of the 3,000-volt d.c. at high speeds, and up to 450 amp. has been collected at 80 m.p.h. At the maximum speed of 118 m.p.h. attained on test the current collected was 200 amp. through two single-shoe pantographs weighing only 300 lb. each. From the details published in this and a future issue of the *Electric Railway Traction Supplement* it will be seen that in both mechanical and electrical phases these new Italian trains embody the soundest and most progressive design.

Return Currents and Track Bonding

AMONG the most expensive items in any d.c. electrification scheme is the bonding of the running rails to facilitate the flow of the return current. For instance, the Southern Railway in its recent electrification extension to Portsmouth, comprising 252 track miles, required about 150,000 welded bonds, each consisting of 10 in. of copper cable with a cross-sectional area of 0·166 sq. in. Track bonding for return current is not necessary as a rule on high-voltage single-phase systems, for on such lines any stray currents found beyond the permanent way are less harmful to water mains or other metal conduits below the ground than are the heavy currents from d.c. railways. But return currents in single-phase lines may set up electro-magnetic effects which can induce voltages in the overhead contact wires or in the core of underground cables carrying low currents. Certain single-phase lines without bonds at the rail joints nevertheless have occasional cross bonds between the two rails of one track, and between track and track. To keep the running rails at earth potential, certain railways, *e.g.*, the Austrian Federal, connect them to earth plates at level crossings and stations, and a similar arrangement is found on a fairly large scale on the single-phase electrified sections of the German State Railway. On certain underground and other d.c. electrified lines with dense traffic an insulated fourth rail is used for the return current, and on the 15 kV. single-phase lines of the Swedish State Railways an overhead conductor parallel to the contact line is used, and connected in sections to the running rails. Modern practice on d.c. railways favours the welded bond on the side of the rail head, the welding being done *in situ*; in some instances, *e.g.*, the Southern Railway, both welded and strip pin bonds are used at each joint.

Swiss Electrification

OF all railway electrification systems in the world, that of Switzerland is probably the best known to the ordinary man, for few of the vast number of holiday-makers visiting that country fail to remark on the cleanliness and punctuality of travel, and the more observant of them notice also the high speeds up the heavy grades on such routes as the Gotthard and Loetschberg. Sections of the Swiss Federal Railways were electrified before the war, but it was in 1923 that a programme of general electrification was begun. The work has been carried on more or less continuously ever since, and 1,320 route miles, or 73 per cent. of the Federal system, are now worked electrically on the 15 kV. single-phase system. Approximately 85 per cent. of the train-mileage and 90 per cent. of the ton-mileage are worked by electric traction, and it is calculated that the economy effected by electrification now amounts to fr. 10·6 millions yearly, excluding the additional saving, due to the devaluation of the franc, through the recent rise in the price of coal. Energy for the electric lines is obtained from two large hydro-electric generating plants, the Amsteg-Ritom group on the St. Gotthard route, and the Barberine-Vernayaz group, located amid the outlying buttresses of the Mont Blanc range, in the extreme south-west corner of Switzerland. These two groups have an installed capacity of approximately 208,000 kW., and generate most of the 518,000,000 kWh. of current used by the Federal Railways yearly. It is not only the Federal lines which are electrified; the two biggest private railways—the Berne-Loetschberg-Simplon (with its associates) and the Rhaetian—are worked electrically throughout their length, and numerous smaller adhesion and rack railways are operated by a.c. or d.c. Indeed, it is only in the north-east corner of Switzerland that there are more than isolated steam lines.

NEW LOCOMOTIVES FOR SOUTH AFRICA

Detailed changes in equipment modelled generally on 95 units built ten years ago

DURING the year 1935 the Metropolitan-Vickers Electrical Co., Ltd., received orders for a total of 25 Bo+Bo locomotives for the 3,000-volt d.c. lines of the South African Railways, and most of these locomotives were necessitated by the various extensions of the Natal electrified system. In general characteristics the new units are very similar to the 95 double-bogie locomotives supplied by Metro-Vick in 1924-26, which have been making mileages up to 7,000 a month at maintenance costs averaging (for the fiscal year 1934-35) 1.84d. per mile.

Embodied in the new locomotives are several changes in detail, and quite a new layout of control equipment. Compared with the machines of the last decade, the weight in working order is 65.6 tons in place of 69 tons, and the maximum axle load is 16.4 tons instead of 17.25 tons; the electrical parts weigh 27.4 tons against 28 tons, and the mechanical portion 37.4 tons against 41 tons. As before, there are four nose-suspended force-ventilated traction motors with an individual hourly rating of 300 h.p., which give an hourly tractive effort of 21,200 lb. at 21.5 m.p.h., and a continuous rating of 16,400 lb. at 23 m.p.h. Multiple-unit control and regenerative braking are incorporated, and there are air brakes on the locomotives with vacuum apparatus for the trains. The mechanical portions (except for the bogies) of 20 of the locomotives were built by R. & W. Hawthorn-Leslie & Co., Ltd., and of five by the Swiss Locomotive Company. The bogies and complete electrical equipment were built by the main contractors, Metro-Vick.

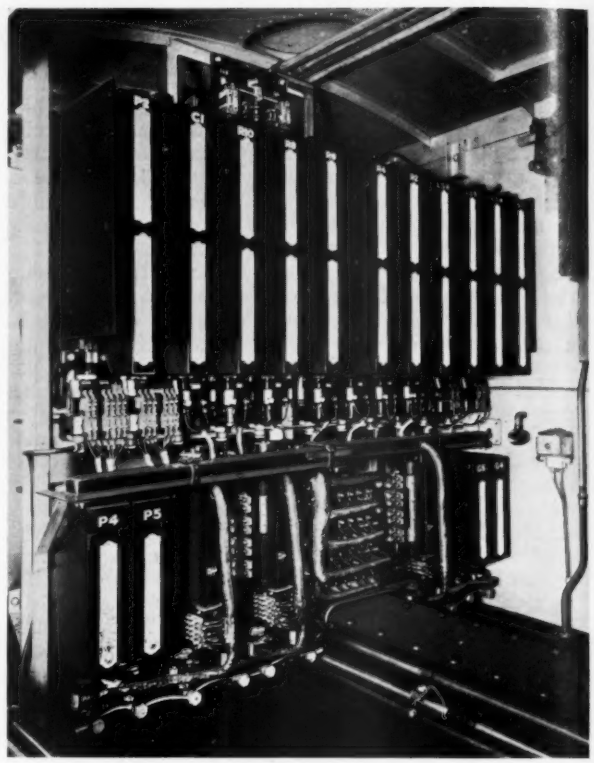
Detail Modifications

The drawgear is of the Alliance automatic type, as the existing rolling stock has been converted to this type of coupler since the first electrification. Timken roller bearing axleboxes have been fitted in place of the usual type of brass in an endeavour to make savings by reduced friction and lesser attention to lubrication.

In the new traction motors the waste-lubricated white-metalled bearings of the original motors have been replaced by roller bearings, with the object of effecting economy in the lubrication attention required in service. The drive to the axle in the original locomotives was from a pinion on the motor armature shaft to a solid gear wheel on the axle; in the new locomotives a spring gear wheel has been fitted which cushions the drive. In the motor-generator sets of the earlier locomotives each motor has two commutators connected in series across the 3,000-volt supply. In the new machines improvements in design have made possible a single commutator with a considerable saving in both bulk and weight of the motor-generators. There are two motor-generator sets, one of 16 kW. and one of 28 kW.; each consists of a 3,000 volt a.c. motor, a d.c. generator, and a direct-coupled blower for the main traction motors.

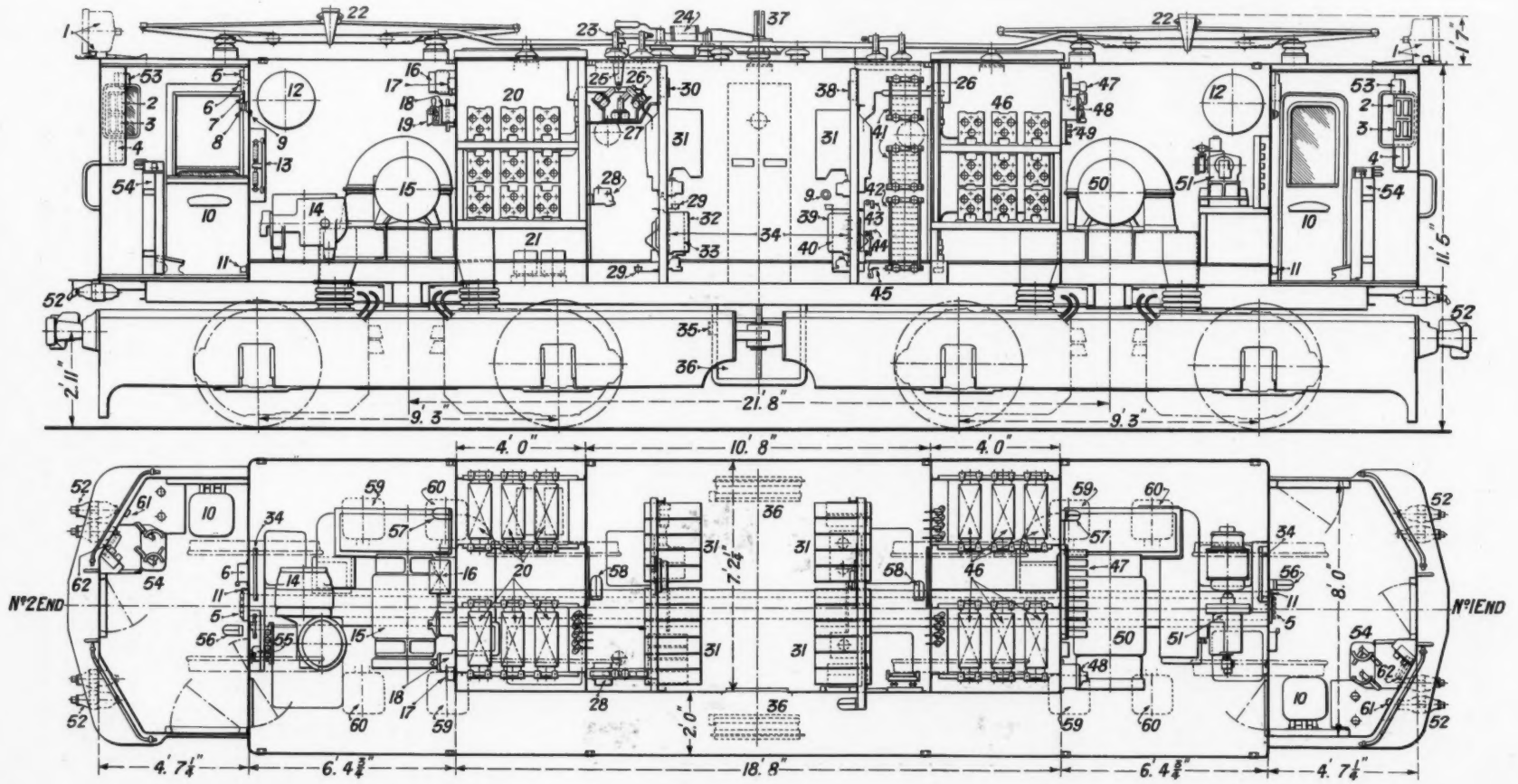
Probably the most extensive changes in the new locomotives are those made in the arrangement and lay-out of the electro-pneumatic control gear, the alterations providing better cooling and ventilation, improved access to apparatus requiring maintenance attention, and a reduction in the time a locomotive is kept out of commission during its regular five-yearly general overhaul.

In the new locomotives the central high-tension compartment is divided into three separate sections, instead of, as formerly, being a single compartment containing both h.t. control gear and resistances. Of these sections, that in the centre contains the unit switches and other control gear, while the two outer sections are used entirely to house the main starting and other resistances. In the original locomotives a clerestory roof was provided above the h.t. compartment to carry away the heat produced by the resistances. In the new design the resistance chambers admit cool air through large mesh-covered holes in the floor, while heated air passes freely away through four large ventilating cowls placed on the roof. A sliding door gives entrance from the central h.t. compartment to each of the resistance chambers, but as these doors are normally closed, both the heat from the resistances and the large quantity of dust associated with the cooling air are excluded from the h.t. control equipment, so that this equipment remains quite cool and comparatively free from dust.



Switch-group assembly, removable as a complete unit, of the new South African locomotives

A notable alteration is that the unit switches and all other 3,000-volt electrical control apparatus in the equipment are mounted in two switch-groups facing each other across the body of the locomotive. Ample space in front of and behind each equipment gives complete accessibility. Any unit switch can be removed and replaced by a new switch in a short time, and during the quinquennial general overhaul either switch-group can be taken out through the top of the locomotive, and replaced immediately by a reconditioned switch-group, thereby making



1. Headlight and Socket
2. Voltmeters
3. Ammeters
4. Speed Indicator
5. Fuse Panel
6. Key Switch
7. Switch Box
8. Heater Switch
9. Lighting Plug Socket
10. Driver's Seat
11. Heater Plug Socket
12. Air Reservoir
13. (2) Motor Cut-out Switches
14. Compressor
15. 16 kW. M.G. Set with Blower
16. Compressor and Battery Resistance
17. M.G. Control Switch
18. Battery Switch Fuse
19. Compressor and Battery Contactor
20. (18) Main Resistance Frames
21. (2) H.T. Auxiliary Protective Resistances
22. Pantograph
23. Pantograph Isolating Switch
24. Choke Coil
25. Thro Insulator
26. Connecting Strap
27. Main Switch
28. Auxiliary Relay
29. Cable Trough
30. Trolley Overload Relay
31. Unit Switch
32. Weak Field Switches
33. M.G. Contactor
34. Control Terminal Board
35. Battery Terminal Box
36. Battery
37. Lightning Arrester
38. Overvoltage and Motor Relay
39. Exciter and Stabilizer Switches
40. Reverse M.G. S.P. Switches
41. Overvoltage Relay Resistances
42. Voltmeter Resistance
43. Field Shunt
44. Armature Shunt
45. Connecting Straps (Stabilizers)
46. (13) Main Resistance Frames and (5) Stabilizer Resistance Frames
47. Exciter Field Contactors
48. Exhauster D.P. Switch and Fuse
49. Exciter Field Resistances
50. 28 kW. M.G. Set with Blower
51. Exhausters
52. Control Jumpers
53. Pantograph Switch
54. Master Controller
55. Control Cut-out Switches
56. Cab Light
57. Machinery Light
58. H.T. Light
59. Armature Connection Box
60. Field Connection Box
61. Dimmer Switch
62. Dimmer Resistance

LAYOUT OF EQUIPMENT ON NEW SOUTH AFRICAN ELECTRIC LOCOMOTIVES

an appreciable saving in the time during which the locomotive is out of commission.

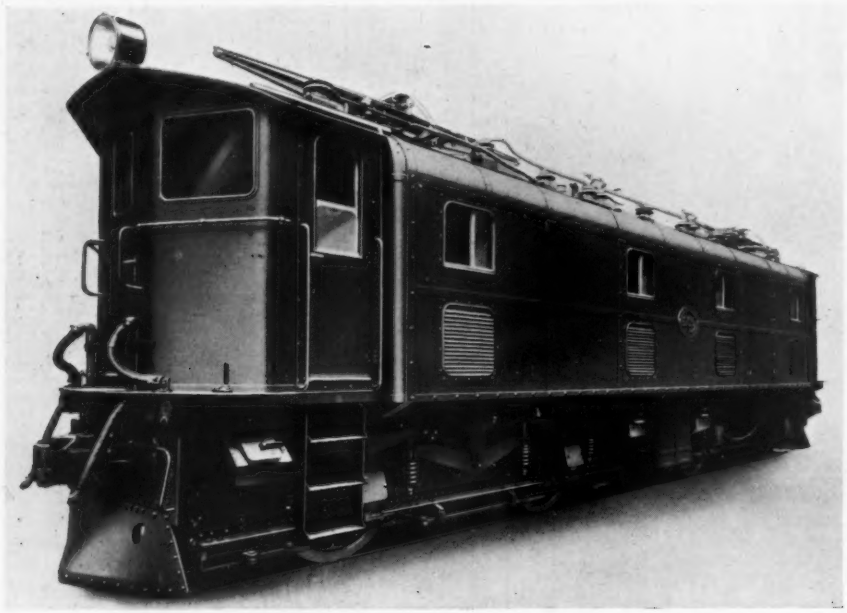
One of the new switch-groups is illustrated herewith. At the top is shown a double-element overload relay, and immediately below are eleven 3,000-volt main switches. The bottom row contains, reading from left to right, two stabilising resistance switches, a motoring regeneration change-over drum switch, a series-parallel motor combination drum switch, a front-connected terminal board, a reverser drum switch, and two exciter field unit switches. All the control wires to the magnet valves and interlocks are permanently connected to the front terminal board, so that it is only necessary to remove the external power control connections from the back of the switch-group, before lifting out the complete assembly.

The three drum-type switches referred to in the preceding paragraph are much more compact than the corresponding cam switch-groups which they replace. Moreover, the drum-type switches have a lower contact voltage drop, and it is anticipated that they will require less attention for maintenance. Similar gains in compactness and maintenance costs have been effected by substituting four smaller type electro-pneumatic unit switches for the cam switch-group used in the earlier locomotives to give the reduced field running notches. Further gains in simplification and compactness have been made in the control gear, consisting of a new type of fuse and contactor for the 16 kW. and 28 kW. motor generator sets, both of the new 3,000-volt motors being switched direct on the full 3,000-volt supply circuit throughout without the use of starting resistances.

In the original locomotives the higher resistance steps of the starting and the regenerative stabilising resistances were of metal strip, the remainder being of cast iron. In the new locomotives these resistances consist entirely of cast iron grids, which permit a more compact arrangement, and have increased capacity, to allow of abnormal shunting and train marshalling with less risk of overheating.

The new lay-out of the high voltage compartment, coupled with the omission of the ventilating clerestory, allows the roof of the locomotive to be level from end to end, and this alteration permits of a more convenient arrangement of the roof gear, such as isolating switches, choke coil, and lightning arrester, which previously was a little cramped. Also, all electrical connections on the roof now consist of bare copper strip supported on strong porcelain insulators, instead of the cable and conduit connections used previously.

The original pantographs had two collecting pans and a contact pressure against the overhead line of 26 lb. The new pantographs have only one collecting pan and exert a line contact pressure of 16 lb., which will reduce wear of the overhead line. The new pantographs each weigh about 400 lb. less than the older ones; they are more rigid transversely, and more easily follow a varying height of overhead line without sparking. An additional valuable change in design gives greatly improved control, by which when a pantograph is raised the collector meets the overhead line without shock, and similarly no shock occurs when a pantograph is lowered. In the driver's cabs the substitution of edgewise pattern instruments for the circular types used formerly has made possible a more compact arrangement which permits of larger windows and improves the driver's forward outlook along the track.



1,200 *b.h.p. locomotive for 3,000-volt d.c. lines, South Africa*

NORD-MILAN RAILWAY.—The Nord-Milan Railway, the Milan—Como line of which has just been electrified at 3,000 volts d.c., is to be taken over by the government and absorbed into the Italian State Railways. At present the line is a subsidiary of the Societa Italiana per le Strade Ferrate del Mediterraneo, which owns an extensive narrow-gauge system in Calabria, and also the Central Umbrian Railway. Plans were made some time ago for the electrification of the whole of the steam-worked portion of the Nord Milan, extending to about 130 miles, and the Milan—Como route is the first portion of the programme to be completed.

HIGH-SPEED TRAINS IN ITALY

The three-car air-conditioned sets are now at work on 60–70 m.p.h. schedules over a 380-mile route

ALTHOUGH they were ordered early in 1935, and the first set was delivered a year ago, the Italian high-speed electric trains have gone into regular service only with the introduction of the summer timetables on May 22 last. This long period has been due partly to the desire to test out thoroughly all the electrical and mechanical equipment, as the whole design was a great departure from anything previously used on the 3,000-volt d.c. lines of the State Railways, partly to rectifying certain defects which became apparent, and, presumably, also to bringing the track up to the standard required for the high speeds.

The principal services operated by these three-car first and second class trains are between Bologna and Naples via the Direttissima, Florence, Rome, and Formia, and there are fast steam connections between Bologna and Milan in each direction. Southbound, the main service leaves Bologna at 15.50 and reaches Florence, 59·5 miles, in 55 min.; the ensuing 196·5 miles thence to Rome are covered non-stop in 190 min., and, after an 8-min. stop at Rome, the 130·5 miles to Naples (Mergellina) are covered in 110 min., the respective start-to-stop averages being 64·5, 62·1 and 71·2 m.p.h. In the northbound direction, Naples is left at 10.20, and the bookings are 115 min. to Rome, 190 min. thence to Florence, and 55 min. over the final stretch to Bologna. Speeds up to 118 m.p.h. have been attained on test between Rome and Naples, and an average start-to-stop speed of 84 m.p.h. maintained between Bologna and Florence.

Built at Milan by the Soc. Ernesto Breda, these six trains each have six 180 kW. 1,500-volt traction motors arranged in three pairs connected permanently in series. Multiple-unit control is fitted so that one or more sets can be operated as a single train. As may be seen from the accompanying diagram the trains are articulated and have a carrying capacity of 35 first and 59 second class passengers together with kitchen, lavatory and luggage accommodation. The tare weight of the three-car train is 105 *tonnes*, and with a full complement of passengers and luggage the total rises to 117 *tonnes*, with a maximum axle load, on the articulation bogies, of 15·5 *tonnes*. The distribution is: outer bogie (kitchen car), 28·2 *tonnes*; first articulation bogie 30·25 *tonnes;* second articulation bogie 29·8 *tonnes*; outer bogie (baggage car), 28·65 *tonnes*.

Body and Framing

The body framing is of welded steel, and aluminium has been used for the interior panel plates and certain

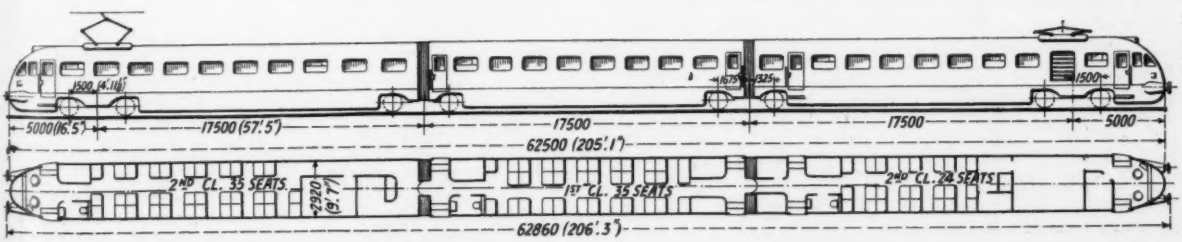
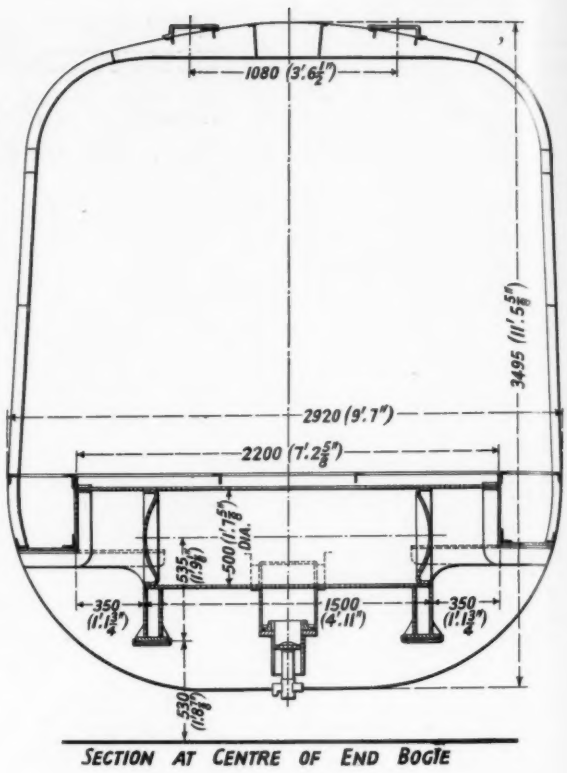


Diagram of 1,450 h.p. electric train, Italian State Railways

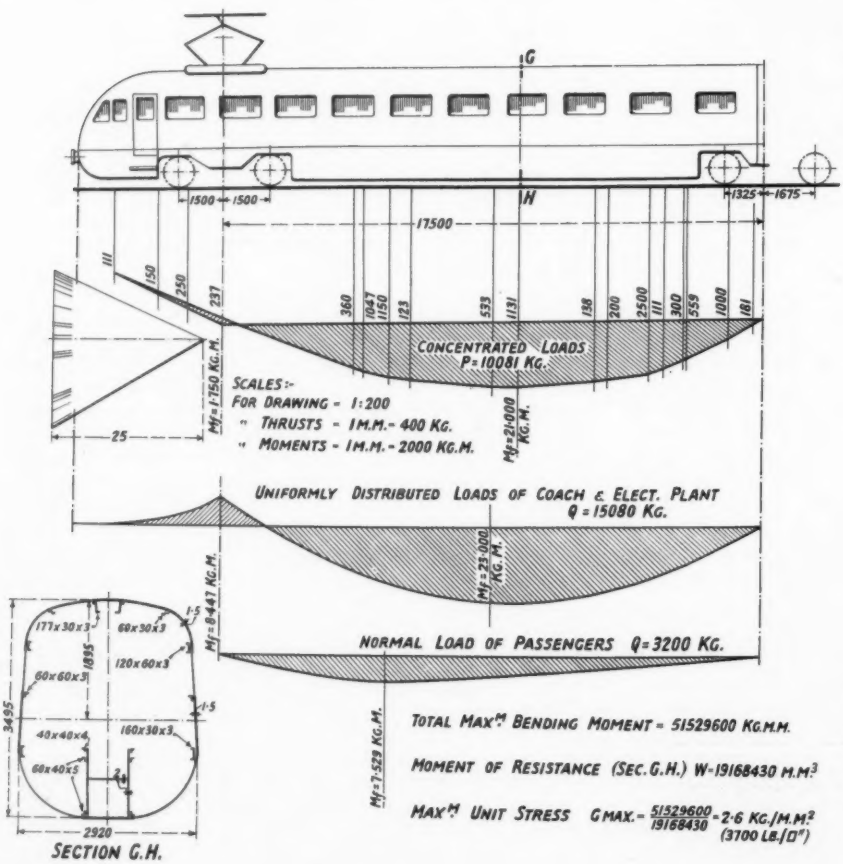
fittings. Air-conditioning is provided in the passenger saloon. The construction of the framework is along the lines of each part taking a share in the stress distribution without any one part being considered as the main member, and by the use of the tubular form of construction shown in an accompanying cross-sectional drawing, the maximum bending stress arising from the concentrated and distributed vertical loads in the kitchen car is only 3,700 lb. per sq. in. The distribution of the bending moments in this car, the most heavily loaded of the three, also is indicated in an accompanying illustration.

The framing is made up of steel angles 3 to 5 mm. thick with steel outer panel and roof sheets 1·5 mm. thick, and the whole of this structure is electrically welded, both the arc and resistance methods being used. The interior panel and roof sheets are of aluminium, 1 mm. thick. The weight of each end coach structure, 55 ft. long, is 9·05 *tonnes* excluding doors, seats, fittings, &c., and that of the intermediate coach, of the same length, 6·58 *tonnes*. The cross-section of the framing was designed specially to take below the floor level the electrical and auxiliary equipments, and these are accessible through inspection doors. Except where cut to clear the bogies, the panel plates and frame members extend right round and form a closed girder or tube.

The profile of the coaches has been shaped to present a small aerodynamic resistance, and the actual design is the result of wind-tunnel tests with $\frac{1}{10}$ and $\frac{1}{20}$ scale models conducted at the aeronautical laboratory in Turin. The coefficient of resistance in the air resistance formula for the full cross-section as shown on this page was found to be 0·254, and the air resistance itself at 100 m.p.h.



Above : Cross-section of welded all-steel body framing of the kitchen car at the bogie centre. All the electric and control equipments are housed at the sides below floor level in the space between the bogies

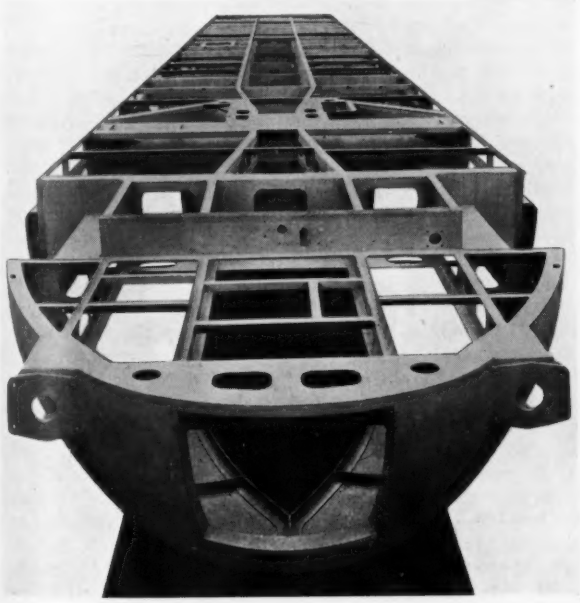


Left : Diagram showing the static loading and bending moments on the leading (kitchen) car of the new streamlined electric trains of the Italian State Railways. It is not considered that the aluminium interior panels and ceiling sheets contribute to the strength of the structure

General view of interior of first class saloon (centre coach) on the new 3,000-volt d.c. articulated trains of the Italian State Railways. The air diffusers in the ceiling are prominent, but the outlets for the circulating air from the air-conditioners are hidden below the seats

(45 metres a second) is $0{\cdot}125 \times 45^2 \times 8 \times 0{\cdot}254 = 515$ kg. (1,135 lb.). The figure 8 represents the cross-sectional area of the car in square metres. This means that at 100 m.p.h. the h.p. absorbed by air resistance is about 305, or almost 50 per cent. more than the power absorbed by rolling resistance. But as on the Bologna—Rome line the power output required to overcome grade resistance is very large, the saving due to streamlining is not so great actually as it would be on more level routes.

A spring-loaded articulation pivot connects the centre and end vehicles, the top portion of the pivot being secured to the centre coach, the intermediate portion to the end coach, and the bottom portion to the bogie. An ordinary vestibule and gangway connects the coaches, but round the vestibule is a flexible hood the same width as the vehicle to eliminate the air gap between the cars and preserve the aerodynamic form of the train.



The welded steel lower portion of the integral body framing

Each of the end cars contains second class seats plus the kitchen in one case and the baggage room in the other, and a driving compartment at each extremity. The baggage compartment has a capacity of approximately 3 *tonnes* and has vertical sliding shutters for loading and unloading. Against it is a separate postal compartment. At various points throughout the train are compartments and lockers for the use of the train staff, and cupboards for food and table storage. There are four toilet compartments in the train. The seats in both classes are arranged two on one side and one on the other side of the central gangway; the backs and cushions are of sponge rubber suitably upholstered. The lighting is in two circuits, with a row of lamps in opaque shades down each side. In the ceilings of the baggage, mail, lavatory and kitchen compartments are ventilating fans.

Air-Conditioning

All the windows in the passenger saloon are of the fixed type. An air-conditioning plant is installed, and in summer is arranged to keep the temperature about six deg. C. below that of the atmosphere. In winter the interior temperature is maintained at 20 deg. C. by means of electric heaters, and the degree of humidity is maintained at about 50 per cent. The air from the exterior is mixed in the fan induction chamber with the air from the interior, after having passed through an oil filter which absorbs the dust. The proportion of air induced from without to that being re-circulated varies from one-third to two-thirds, and the air in each coach is changed completely every $2\frac{1}{2}$ min. From the fan the air goes to the air-conditioner, which comprises a cooling element of welded copper tubes with aluminium fins, between which is evaporated freon; a heating element of 20 kW. capacity; and a humidifier, in which a jet of air from an 0·8 kW. motor-compressor set is mixed with water and introduced to the circulating air from the heating element. The plant is arranged in two groups one on each of the end coaches. Each group provides the conditioning for its own coach and for half of the centre coach. Each group includes a 10 kW. motor-compressor set and a condenser for the freon. The operation of the various components is automatic, through a 24-volt control circuit connected to switchboards near each driving position.

(*To be continued.*)

Publications Received

Etude Théorique de la Marche d'un Train.—(A theoretical study of train running.) By Ph. Tongas. Paris (8e): 12, place de Laborde. Price not stated.—The nomogram dealt with in this leaflet is used in the theoretical study of train working over a line of known profile with any type of traction in which the speed-time curve is in the form of a trapezoid, and, as drawn up, is intended particularly for use with vehicles having constant-speed motors. After having set out the problem in equation form and indicated its solution by means of simple diagrams, the author explains the construction and use of a line chart, by which may be calculated any one of the five following quantities, provided that the other four are already known: acceleration; deceleration; speed; length of run; duration of journey. A full-page line diagram, which can be used direct for approximate calculations, demonstrates the basic principle of the author's method, which consists of representing train running by means of a figure plotted in a system of axes, times being shown by abscissæ and speeds by ordinates. This leaflet is actually a reprint from the *Revue Générale de l'Electricité*, dated January 23, 1937.

Electric Trains. By W. A. Agnew. London: P. Virtue & Co., Ltd., Holborn Circus, E.C.1. $10\frac{3}{4}$ in. × $8\frac{3}{4}$ in. Two volumes. 506 pp. Illustrated. Price £2 5s.; by monthly payments of 5s. if desired.—It is not uncommon in the Germanic countries to find technical works written by high railway officials, but in Britain such books have been confined largely to instruction manuals for the lower grades of the staff. As former Chief Mechanical Engineer of the London Passenger Transport Board, Mr. Agnew is in an almost unrivalled position to disseminate valuable information on urban and suburban electrification; nevertheless, he has preferred to cater only for the staff employed in the operating and repair departments, and in consequence these two volumes comprise mainly simple descriptions of various parts of the electrical and mechanical equipments of electric locomotives and trains, and as, not unnaturally, the author has had in mind the needs of the L.P.T.B. staff, the work has its limitations even in this direction. For example, only d.c. traction is considered.

There is little doubt that the material which Mr. Agnew has compiled—with some pains, we should imagine—will be of great use to the large numbers of motormen, fitters, and other traffic, mechanical, and electrical grades on the electrified lines in this country and in other English-speaking lands with low or medium tension d.c. systems. It may be questioned, however, as to whether it is not better to have small manuals suited to each particular railway rather than a compendious description endeavouring to cater for all. In a work for this particular field there is always room for an early chapter on the fundamentals of electricity and magnetism, and both in this division and the ensuing section on traction equipments Mr. Agnew has written with a simplicity and directness which it should be hard to misunderstand. Practically the whole of the first volume is devoted to ordinary traction control apparatus and multiple-unit equipments, and among the control systems thoroughly described with the aid of line diagrams, folding plates and half-tones, are the Met-Vick equipments on the Southern Railway's express and suburban stock; the same company's control on the L.P.T.B. tube trains; the G.E.C. and B.T.-H. equipments on various types of L.P.T.B. stock; the G.E.C. control on the L.M.S.R. Watford trains; the English Electric camshaft control; the Crompton-West control on the new Tyneside trains of the L.N.E.R.; and the equipments on the M.S.J.A.R. trains and on the new Wirral sets of the L.M.S.R. If one would dare to suggest an omission from such a comprehensive list it would be the several types of multi-notch controls evolved last year for the four trial trains of the L.P.T.B.; however, drivers in general are not likely to meet with these.

The second volume begins with a short chapter on nose-suspended traction motors for 600-volt. d.c. systems, which is followed by lengthy descriptions of the details of air, vacuum, and electro-pneumatic brakes. After a brief *pot-pourri* in which speed-time curves are bunched together with defective brake pipe hoses in the same chapter, Mr. Agnew deals at length with the electrical equipment of three well-known d.c. locomotives, including those evergreens the ex-Metropolitan double-bogie units, but cuts off pantographs and collecting shoes with a couple of pages. Technically, the kick in this book is in the tail, for it is at the very end that the metadyne control as used by the L.P.T.B. is described with the assistance of many line and half-tone illustrations.

Special considerations must have led to the pricing of a book intended for lower staff grades at forty-five shillings, but the format may lead many to suppose that the price was settled first and the book filled out to suit, for there is no balance in the illustrations, certain unimportant drawings and half-tones being given full page width while sectional drawings of complicated details like triple valves are given a beggarly three inches. Again, at least two dozen of the illustrations are of no value, and the paper used does not allow of much detail being visible in the half-tones. However, the type is clear and can be read easily at a distance of six feet, and there is ample space on each page for making notes.

Notes and News

Brazilian Electrification.—According to the latest reports, the first electrified section of the Central Railway of Brazil, from the Dom Pedro II terminus in Rio de Janeiro to Engenho de Dentro, has just been opened.

New American Locomotives.—Six 3,600 h.p. 2-Co-Co-2 express electric locomotives have been ordered from the American General Electric Company by the New York, New Haven & Hartford Railroad for service on its 11,000-volt single-phase lines.

Greek Electrification Scheme.—It appears that the dispute between the Athens Electric Company and the Greek Government, which has lasted since 1933, has been settled, and that under the new agreement the Attica Railway between Athens and Kephisia, will be extended and electrified. Existing and contemplated electrification schemes round Athens were described (with the assistance of a map) in the issue of this Supplement for April 5, 1935.

Swiss Trains.—The Berne-Loetschberg-Simplon Railway is to acquire three lightweight electric train sets, each consisting of two close-coupled cars with four 200 h.p. motors, and the associated Berne-Schwarzenburg Railway is to acquire a third, which will be of somewhat different design. Each train is to have a carrying capacity of 18 second class and 146 third class, and they will be able to haul trailing loads up to 80 tons. In addition, the B.L.S. will shortly place in service two more lightweight single-unit railcars of the type illustrated in the issue of this Supplement for December 13, 1935.